# AMERICAN GAS JOURNAL

AUGUST 1942



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## MISSIONARIES OF "MEASURED HEAT"

• Many valuable facts are being offered these days on the vitamin content of foods. But have you noticed how little the public is told about how to cook these foods so that these vitamins may be preserved?

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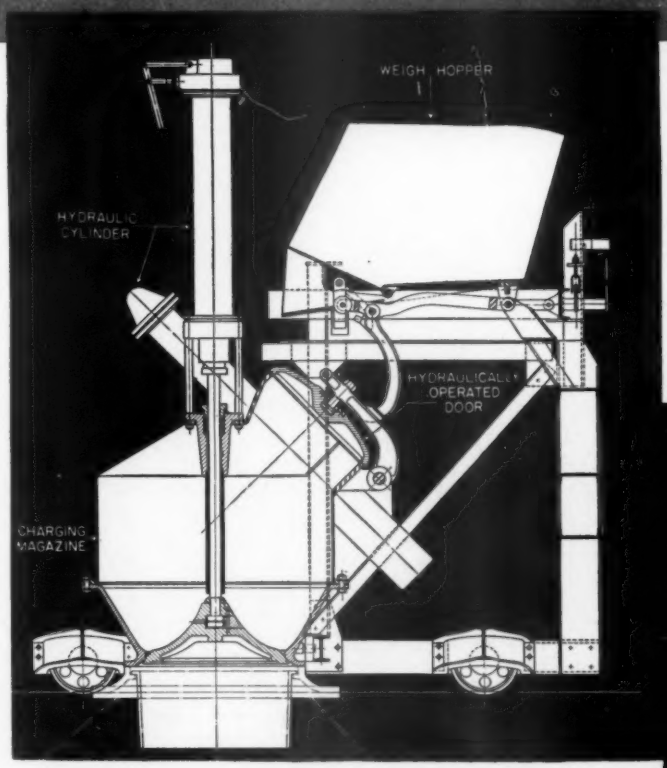


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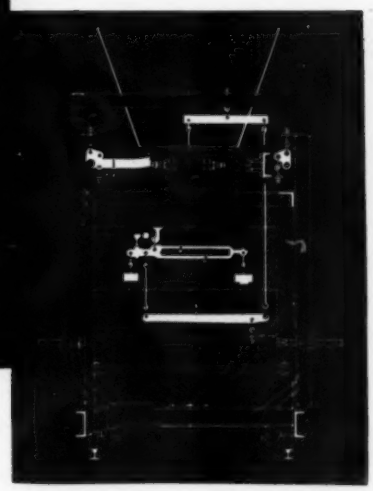

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**40 Rector Street** — **New York, N. Y.**


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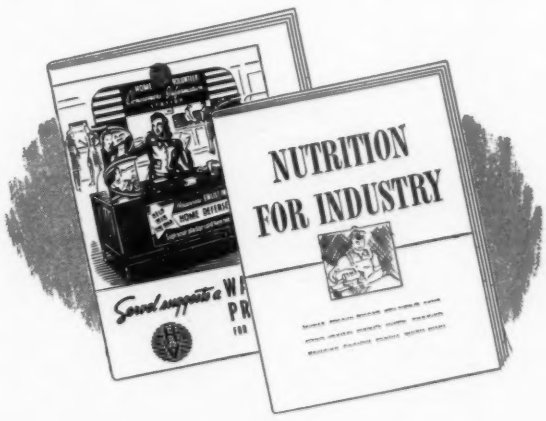


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*have been installed*
*or are under construction in*
*eight chemical plants and*
*seventeen utility plants*

## UNITED ENGINEERS & CONSTRUCTORS INC

NEW YORK PHILADELPHIA CHICAGO

AUGUST
1942

AMERICAN
GAS JOURNAL

VOLUME 157
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# Protection of Company Records Against Air-Raid Hazards

By
P. G. Wharton
General Auditor,
The Atlantic Refining Company,
Philadelphia, Pa.

***While this article deals with the protection of records of an oil company, the procedure we feel will be of interest to all gas companies.—Ed.***

ONE of the wartime problems is to determine the extent to which it is possible and desirable for management to provide protection for its records and, in doing so, to reduce the hazard of destruction by enemy attacks. With that matter in mind we have attempted, as a supplement and guide to our own thinking, to obtain information as to the steps already taken by companies representing diverse types of business in this country, and also to couple this with the experience of organizations in countries that have been subject to air-raid attacks.

According to our understanding, it is the general conviction of the British and those on the Continent that the problems of safeguarding records come under two distinct headings. These are (1) duplication of records, and (2) distribution of records.

Their view is that if both the originals and duplicates are in separate places in the same building, a very low degree of protection exists. Neither does it offer protection to put both copies in the same town or anywhere near the same town. The opinion is that the records must be distributed sufficiently far apart to make sure that originals and duplicates cannot all be destroyed in one attack.

In considering protective measures, physical limitations should not be overlooked. Because of the time element, the scarcity of needed material, and the cost of obtaining an approach to total immunity, it is obviously impracticable to provide complete protection. What must be done is to make the best possible use of available devices and shelter, and organize to make effective use of them.

No one can foresee just what damage a concussion will cause, although it seems to be conceded that steel-frame structures are more resistant to collapse than any other type of building. Even so, all the building areas available for peacetime use are not serviceable under present conditions. For instance, considering a 21-story building, the opinion is held that areas above the 17th floor and below the third floor are not safe, either for individuals or for the placement of valuable records. The upper floors would be open to a direct hit, and the lower floors and the basement would be liable to damage by concussion or from water, gas, and debris. It may be concluded that records maintained on the intermediate floors would be fairly safe if protected by fire-resistant equipment. However, the purchase of such equipment, even if obtainable at this time, would be surrounded with difficulty and, moreover, is expensive.

## Classification First Step

Obviously, the first step to be taken in safeguarding files is to classify all records and separate them into groups based upon their relative importance. In our own organization, we have made a tentative classification into four broad groups.

Class 1 consists of "Vital Records." In this group are papers and books that are indispensable for the continuance of the business. Among these are engineering studies and plans of critical plants or equipment operated by the company; accounts receivable; minute books of the board and executive committee; important contracts and agreements; service and pay-roll records of employees and matters pertaining to pension records; the general ledger of the company; records of property as well as details of depreciation; reports and statements to stockholders; Government questionnaires and reports; record of securities owned; notes; lists of deeds, bonds, mortgages; and files on important matters under litigation.

Class 2 includes "Important Records." These are such as can be re-

produced from original sources only at considerable expense. In this group may be included the many statistics and supporting data, as well as accounting records needed for the establishment of the correctness of entries and other papers; operating records and reports; and ledgers and books of the several divisions of the company.

In connection with those two groups, it might be desirable to make a further classification according to the degree of location risk.

Class 3 includes "Useful Records." This refers to records which are helpful for routine assignments and the smooth operation of the business—documents whose loss would occasion inconvenience, but would present no great obstacle to the continuance of the business. Included among them would be papers substantiating loss and damage, personal injury, fire and other claims after the claims have been settled; distribution and summaries of labor expenditures, stock ledgers, materials and supplies; bids and offers, including correspondence pertaining to the sale and purchase of materials and supplies; bills of lading and shipping orders after material has been received; and pay checks and other evidences of payment to employees.

Class 4 relates to "Nonessential Records"—meaning those that have no long-term value.

Having determined the classifications, next must be considered the methods of reproduction. Among these methods are: transcription of records in the identical manner in which the originals were prepared; copies prepared by photography and blueprinting; and duplicates prepared on the typewriter or by using a duplicating machine.

The first method might be used for such items as the general ledger of the company, tax statements and supporting papers, and similar documents. The deciding factor would seem to be the volume of labor required to produce the finished record twice, versus the cost of reproduction either through the medium of photography or blueprinting.

Duplication by photography would call for consideration of the length of time during which the prints would be retained, the rapidity with which the originals would change and so necessitate change in duplicates, and also the volume of duplicate prints as related to the equipment and space needed to store the material.

The third method of reproduction mentioned speaks for itself.

One broad rule worthy of consideration is that if a given area is considered safe for employees, it is certainly adequate for the protection of records. Referring again to the 21-story building, it is reasonable to suppose that records located on the intermediate floors, if protected adequately from fire hazards, would likewise be reasonably safe from destruction. Even on this premise, it may be advisable to reproduce certain of the Class 1—Vital Records.

Protection of current working records, particularly on those intermediate floors, would present no insuperable problem. Each section, group, or department should designate individuals, whose responsibility it would be, in the event of an air-raid alarm, to remove all records, according to their classification, to the vault, safe, file, or wherever such records are normally placed.

## Control Committee Suggested

One suggestion encountered in our survey is that the importance of records and their disposition to safe areas should be entrusted to a committee which would represent all departments and would settle such points as the value of records and the method to be used in their reproduction. The committee should also consider the records of any existing branch offices. In this connection, there appears the thought that a branch office might serve as a suitable repository for valuable papers in case the location is inland at a point remote from the seaboard.

In our organization are two standing committees: one for the domestic marketing department and the other for domestic producing, manufacturing, and the other divisions of the company. These committees, with the advice and consent of the several department heads, have heretofore established definite periods for which all records, reports, etc., should be retained. It is the thought that these same committees, with the assistance of the department heads, and utilizing present lists of records, are ideally situated to establish classifications according to degree of importance and inconvenience or loss to the company in the event of the destruction of these records; also to determine the preferred medium of reproduction, the frequency of reproduction (*i.e.*, accounts receivable, detailed plant records, etc.), where the work should be done, and the storage location of both the originals and the transcribed, photographed, or duplicated mediums.

The difficulty in giving close and active consideration to the safeguarding of records springs from the fact that the hazard, while it can be extremely destructive, is of such a nature that no one can foresee its imminence or even its possibility. Consequently, there is a reluctance on the part of industry to advocate taking extreme measures that would necessitate the expenditure of substantial sums. And even if a business house were prepared to construct a storage building at a point considered safe, then would arise the difficulty, perhaps insurmountable, of obtaining the necessary materials and labor.

Obviously, there is no general answer to what might become a general problem over wide areas. The only thing that management can do is to attempt to make provision on an individual basis in order to satisfy individual needs, all based on foresight and good business judgment.

The purpose of our study was mainly to discuss policy and principle, permitting the detailed application to be assigned to the committees mentioned. Since these committees, with the department heads, have not completed their work, we cannot at this time furnish more specific or definite information.

*Executives Service Bulletin, June, 1942, Metropolitan Life Insurance Company.*

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## What Is Follow-up?

Supervisors are told that after the initial instruction of new people, it is extremely important that the correct follow-up supervision be given. Just what are the specific steps that a supervisor should take in effectively following up on instruction?

1. Maintain a constant check on the learner's performance.
2. Catch and correct mistakes at once. Do not allow a new worker to establish bad work habits which must be unlearned later.
3. Be sure to observe and commend the good work of the learner.
4. Strive to maintain the congenial instructor-learner relationship between yourself and the employee. Make him feel free to come to you at any time in the future if he has new problems. Do not let the worker feel that after you have completed the initial instruction you are no longer interested in him or his progress.
5. Be sure that each new employee knows definitely to whom he may turn when he needs advice.

*Remember, instruction is never really ended. Three-quarters of all good supervision is instruction. Of course, the better the original instruction the less time required for subsequent follow-up.*

# Observations From Data Taken With a Flash-Back Instrument

By
**J. A. Morrison**

Supervisor of Laboratory,
Distribution Department,
The Consumers' Gas Company of Toronto

SEVERAL YEARS AGO the writer commenced an investigation into the causes of the large number of complaints on gas appliances. On a shelf in my laboratory was an instrument invented in 1920 by a Mr. Blomquist, of the Stockholm Gas Company, Sweden, which was called a Nedslagsbrannare—in English it would mean Flash-Back Burner. This instrument, shown in Figure 1, had been purchased in 1924. Since many of the consumers' complaints were caused by burners backfiring or being excessively noisy, it was hoped that this odd looking Swedish instrument would measure some quality of the gas which was perhaps having more effect on satisfactory burner operation than either calorific value or specific gravity.

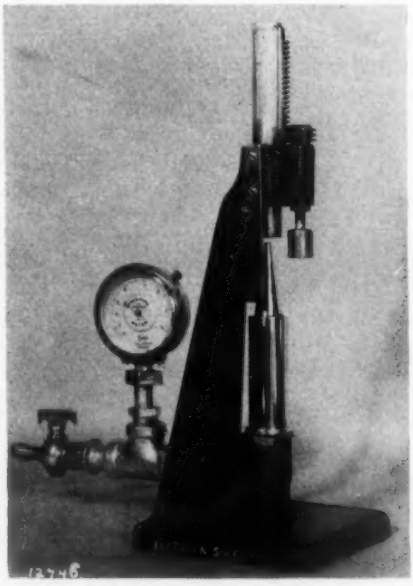

Figure 1—The Swedish Flash-Back Instrument.

So the Swedish tool was put to work and observations made every half hour and compared with the actual performance of various appliance burners. It was soon found that when the instrument gave a low reading, of say 23, the gas flames on bunsen burners were very sharp and susceptible to flash-back, and when the reading was high, say 32, the flames were long and tending to give incomplete combustion if the burners were overloaded. At the 1940 convention, a paper was read giving a survey of what women thought about gas in one Canadian city and you will recall that their chief objection was odors. A corresponding survey made in an Eastern United States city, showed that similar objections existed there. Now, odors can be caused by bunsen burners backfiring due to the flames becoming too sharp and also by smothering and incomplete combustion due to the flames becoming too long.

***"The writer is only one of many who have realized the need for a standard instrument and surely after all the work that individuals have already done in designing burners, it is time that the Gas Industry had a standardized test instrument like the petroleum industry. The undertaking is so big that it should be given either to the American Gas Association Laboratories or to the recently founded Institute of Gas Technology to complete"***

This variation in the flame structure is characteristic of mixed artificial gases and becomes quite pronounced where carburetted water gas is used only for peak load periods. There is also a difference in the gas from horizontal and vertical retorts, especially if steaming is done in the latter. This Swedish instrument has been very useful in indicating better ways of mixing these different gases. It was also the means of clearing up the mystery of why burners in a certain large plant should backfire at about 4.40 p.m. on several consecutive days. To solve this trouble it was necessary to read the flash-back index number every minute from 4.50 to 5.00 p.m. to make allowance for the speed of gas in the mains since my laboratory was one-half mile beyond the plant in question and one mile from the Gas Works. The readings of one day for this ten minute period were as follows: 28, 27, 25, 23, 21, 19, 18, 20, 22, 24, 26, and with indications as low as 18 it is no wonder the burners backfired. Our observations lead us to believe that the burners had been tripped off by a slug of either air or unmixed water gas in the city mains. The Works Department subsequently found that a certain shift operator was inadvertently leaving a water gas valve open for as much as ten minutes on the days when there was trouble. For detecting trouble like this, the Nedslagsbrannnare has the usual slow recording instruments beaten a dozen times over.

## The Swedish Flash-Back Tester

In brief, this instrument is essentially a bunsen burner with an adjustable primary air opening with the size of the opening indicated on an empirical scale. To operate it, the gas is turned on and ignited and the pressure adjusted to 3 inches water column. The pressure gauge shown in the illustration was made in England and is not part of the instrument. The air shutter is then opened gradually until the flame starts to give an occasional sputter. This point gives one reading on the instrument but our practice is to increase the opening, also the readings, about another 10 per cent to the flash-back point. Taking the reading this way, after about six sputters, seems to give a more definite point on the scale. so much so that various operators usually read the same indications with the maximum deviation being ½ index number.

It does not matter whether the room is bright or dark since there is no cone to observe, and atmospheric temperature and pressure do not appear to affect the readings. When the flame backfires to the orifice it just requires the lifting of a cylindrical sleeve to completely close the primary air opening and to put the flame on the port again. In this manner, several check tests per minute can be made if necessary. After two minutes' operation the burner tube becomes heated sufficiently to lower

the readings about ½ index number, but since spot tests can very quickly be made this heating up is not a serious fault and can always be allowed for anyway. Since the air opening is vertical there is never any trouble with dust and lint choking it up and, in addition, the lifting of the sleeve has a cleaning effect. The instrument is light in weight, readily portable, quite rugged and practically fool-proof.

The diameter of the burner port and tube is .55 inch. The length of the tube is 4¼ inches, but since this tube slides up and down with respect to the orifice, the port to orifice distance varies from about 3¼ to 4¼ inches. The orifice is No. 51 drill size and passes approximately 11 c.f.h. of manufactured gas.

The average reading on a 485-490 B.T.U. gas is about 27 F.B.N. (flash-back number) and this point will be considered the datum for the following discussion. At 27, the primary air to gas ratio is 3.4. The maximum variation in this index number for satisfactory burner operation is from 24 to 31, at which points the air/gas ratios are, approximately, 3.05 and 3.75 respectively. Bunsen burners adjusted on an average gas of 27 F.B.N. will become noisy and so sharp that they are on the point of backfiring if the F.B.N. drops below 24. Similarly, if the quality of the gas changes in the other direction and goes above 31 F.B.N. the flame will become so long that there is a possibility of incomplete combustion and odors.

Chart No. 1, which is a plot of index numbers on B.T.U.'s, shows these conditions in graphical form with the satisfactory area of operation extending from 24 to 31 F.B.N. Below 24 is the flash-back area and above 31 the incomplete combustion area. No such definite limits can be set for the B.T.U.'s because of the lack of relationship between index numbers and calorific value. For instance a 490 B.T.U. mixed artificial gas may have any F.B.N. reading from 24 to 32 inclusive, likewise a gas reading 27 F.B.N. may have any gross calorific value from 476 to 495 inclusive. It has already been stated that actual burner performance was indicated by these F.B.N. readings, this chart now shows that it does not depend on calorific values. For example, one point on the chart shows a 485 B.T.U. gas in the flash-back area with a 475 B.T.U. gas in the satisfactory area. Likewise a 498 B.T.U. gas is satisfactory but a 489 B.T.U. gas is not because of long flames tending to cause incomplete combustion.

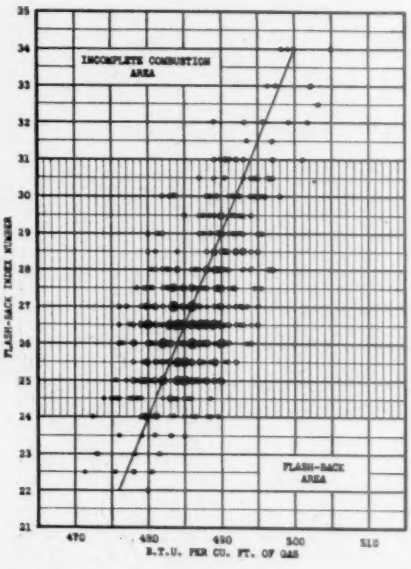


Chart No. 1—Relationship between flash-back index number and gross calorific value.

The reason why manufactured gas behaved like this was not known, and as my laboratory did not possess gas analyzing equipment it was decided to try and find out by mixing different gases, either bought in cylinders or prepared chemically, with city gas to see their effect on the Swedish index readings.

Chart No. 2 shows the results when different gases were added to a base gas of 26 F.B.N.; if it had been 27 F.B.N. our arbitrary datum, the results would still have been practically the same. Of the combustible gases carbon monoxide appeared to be much the worst for causing flash-backs, with hydrogen not having much effect despite its extremely high flame velocity. Acetylene has been included, although not usually found in city gas, because it makes an interesting comparison with ethylene; both gases have practically the same calorific value and specific gravity, but due to the difference in flame velocity, acetylene does not cause as much increase in the F.B.N. reading as ethylene. Straight acetylene reads 45, hydrogen 17 and carbon monoxide 5, all the other combustible gases are, of course, beyond the range of the instrument when used undiluted. The inert gases all lower the index readings in varying amounts depending to some extent on the different specific gravities. Thus, we see that all the gases can be divided into two groups, hydrocarbons and non-hydrocarbons; the hydrocarbons raise the index number and the non-hydrocarbons lower the index number, and it does not matter whether the gases in this latter group are combustibles or inerts.

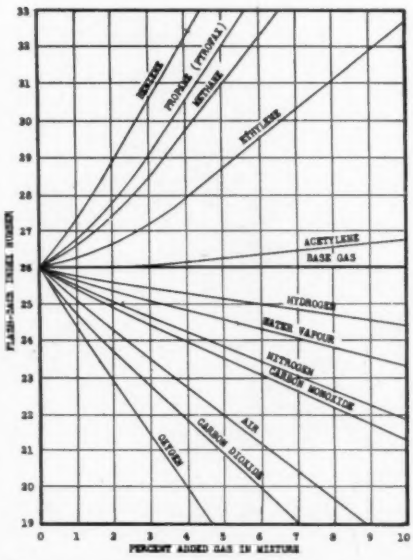


Chart No. 2—Effect of various gases on flash-back index numbers.

These readings, unfortunately, cannot be compared with similar observations in other Canadian or American cities because the instrument we are using has not been standardized like gas meters and calorimeters and, furthermore, it may be the only gas tester of its kind on the continent. The writer would appreicate hearing about others, if any. What this instrument measures is the cone forming and flash-back properties of city gases. The index number is influenced by calorific value, specific gravity, theoretical air required for combustion and flame velocity. It is rather difficult to define this measurement, and the nearest comparison seems to be with the octane rating of gasoline of which you are all more or less familiar.

## Comparison with Gasoline Octane Rating

In 1933 the American Petroleum Institute, in cooperation with the Automobile Manufacturers' Association and the National Bureau of Standards, developed what is known as the C.F.R. Motor Method of determining the knock characteristics of motor fuels. This special engine has a means for varying the compression ratio and when run at a standard speed and temperature indicates by means of a bouncing pin the octane rating of the gasoline tested. It is used by engine manufacturers and petroleum producers as a basis for all research in engines and fuels. A mixture of varying percentages of octane and heptane is used to calibrate the engine. Octane is an anti-knock fuel while heptane is very bad

for knocking. These standard testing engines can readily be purchased from a manufacturer in the United States and by their use both gasolines and motor car engines have been brought to a high degree of perfection and efficiency.

When tires and gasoline were plentiful and we were frequently crossing country, provincial and state borders, did we always inquire about the B.T.U., the specific gravity or the chemical composition of the gasoline we were buying? No, all we were interested in was the octane rating and, if the car ignition had been adjusted for an 80 octane gasoline in our city, we knew we were safe in buying any 80 octane gasoline anywhere from Halifax to Los Angeles, although it may have been very dissimilar in chemical composition. Last year, when the Canadian Government decided as a war measure to reduce the number of different grades of gasoline the standard chosen was the octane rating, Grade 1, having an octane rating 75 to 78, and Grade 2, 66 to 70. There is also a lower grade for stationary engines and a higher grade for aeroplanes. Low octane gasolines can have the number raised by the addition of small amounts of tetraethel lead. Engines designed with high compression ratios for high octane gasoline will not work on low octane gasoline.

It is the same way with gas appliances, natural gas burners designed for a gas high in hydrocarbons will not work on manufactured gases with a low percentage of hydrocarbons, and vice versa. It has been observed that the Swedish flash-back index number was almost equal to the hydrocarbon content of the gas under investigation. If city gases and burners could be rated in hydrocarbon numbers or perhaps even more simply in methane numbers like gasolines and engines are rated in octane numbers, it would be the greatest advancement ever made in the gas industry. The way it is now, my laboratory has to test and set an arbitrary rating to the gas appliances we buy. For instance, some time ago, some A.G.A. listed manufactured gas conversion burners were tested out and it was found that they required a gas equivalent to 32 F.B.N., which is too high for our situation, so the burners were returned as unsuitable. The high B.T.U. hydrocarbon gases, such as propane, would have a reading over 100—something similar to the best grade gasolines which run as high as 120 octane. Just as with gasolines and engines, a slight variation in either burner design or gas composition is permissible, but without having a standard measuring instrument for this purpose, all too often the burners and gas are not suitable for each other. More so, perhaps, since the A.G.A. Laboratories dropped the low methane gas (water gas) that they formerly used as one of three test gases and substituted in its place a high methane gas for the large number of companies now mixing natural and manufactured gases.

The need for a standard gas testing instrument prompted the writer to make a research of gas literature to see if such an instrument was obtainable. It was found that the gas industry in England was trying out a standard burner at the present time. Information on this burner, as well as others, is given below.

A ping or two in a motor car engine is nothing serious, but the equivalent of a ping (flash-back) with an automatic gas pilot will quite likely shut down the appliance or, if the automatic safety valve still remains open, there is a possibility of gas odors from the pilot, and a complaint which may necessitate a serviceman calling.

In September, 1941, Dr. Thomas Midgley was presented with the Priestly medal for discovering how tetraethel lead raises the octane number of gasolines. What we want is someone to win a medal for discovering some inhibitor to add to city gas to stop it from backfiring. In England they have been experimenting with flash-backs and inhibitors but the war prevents disclosures.

## Other Gas Testing Burners

The next gas testing burner that I am going to mention is the Lanphier Caloroptic, Figure 2, invented by C. Lanphier, an American, in 1918, but first made in Toronto by the Sangamo Electric Company, believe it or not, and within a stone's throw of where my laboratory is now situated. The present manufacturer is the Connelly Iron Sponge & Governor Company, Chicago. The patent states the instrument to be a portable calorimeter. The adjustable primary air shutter on this burner has 40 threads per inch and is graduated like a micrometer, reading directly in B.T.U.'s. The reading is made when sufficient primary air has been admitted to just bring the yellow tip on the inner cone to the vanishing point.

An adjustable needle valve in the gas orifice allows the instrument to be calibrated against any standard calorimeter and, if always used on

Figure 2—The Lanphier Caloroptic.

that same gas, will indicate the gross calorific value to within a couple of B.T.U.'s. Tests made on a recently acquired Caloroptic show that the reading is low if the percentage of carbon monoxide in the gas increases, and slighily high if the percentage of benzene increases. This is because the instrument indicates the net calorific value multiplied by the theoretical air required per cubic foot of gas, divided by the square root of the specific gravity. Carbon monoxide is the gas departing most from the average values, see Table No. 1. For the usual gas variations the reading is fairly accurate and shows gas changes instantly. However, inasmuch as the Caloroptic measures calorific value, it is not as sensitive in indicating a gas likely to cause backfiring as the Swedish flash-back instrument. At the present time, it appears to be the only gas testing burner of any kind procurable on this continent.

Another important test burner obtainable, is the Aeration Test Burner, Figure 3, manufactured by Alexander Wright & Company, London, England, and is the standard in that country. Model A was brought out in 1937 and an improved Model B in 1940. This burner is a modified design of the 1934 Prufbrenner of Czako and Schaack of Germany (British patent No. 416972) with simplifications and improvements suggested by the Watson House Laboratories Research staff. In this design, the primary air is regulated to give an inner cone exactly 19 mm. (¾ in.) high which, one might say, is midway between the flash-back of the Nedslagsbrannare and the yellow tip of the Caloroptic. The burner tube and port is .404 in. diameter with a water cooling jacket around the top part of Model A (full length of Model B). The orifice, of No. 61 drill size, is punched in a gold plate

in Model A and in a German silver plate in Model B. The screw type rotating air shutter on Model A has been replaced with a slide valve on Model B. However, the biggest improvement in Model B is the enlargement of the mixing tube which enables higher air/gas ratios to be obtained. This test burner gives a numerical expression for the cone forming properties of city gas, much like the Swedish burner. The following table giving the A.T.B. numbers (Model A) for several English town gases all of the same calorific value, 500 B.T.U. per cubic foot, made by mixing coal gas, 565 B.T.U., with various diluents including carburetted water gas, shows that there is no definite relationship between B.T.U.'s and burner index numbers.

| | |
|---|---|
| **Coal gas + flue gas** ..... | 82 |
| **Coal gas + producer gas** ..... | 79 |
| **Coal gas + blue water gas** ..... | 73 |
| **Coal gas + 422 B.T.U., C.W.G.** .. | 59 |
| **Coal gas + 461 B.T.U., C.W.G.**.... | 53 |

The allowable variation in the A.T.B. number of city gas is stated by Mr. Minchin of Watson House, to be plus or minus 10 numbers if the gas appliance is adjusted for a mean of 75 A.T.B. The Leeds Gas Company, in 1938, reported that the A.T.B. number of gas from their steamed vertical retorts varied from 57.6 to 69.6, and from the horizontal retorts 60.9 to 72.4, which is a total spread of 12 numbers. All of the above numbers are on the Model A scale as not much information has been printed in the English gas journals on Model B readings, probably due to the war. In Holland before the war, the general conditions for appliance testing required that an appliance adjusted on a standard gas of Prufbrenner number 65 should, without any alteration, accommodate gas of numbers 57 to 70 without lighting back or exceeding CO limits.

Figure 3—The English Aeration Test Burner Model A.

The explanation for the drop in the A.T.B. numbers in the above table as the B.T.U. of the diluent gas is increased, is because the hydrocarbon content of the mixed gas drops and the A.T.B. numbers are more closely linked with the hydrocarbon content than with the calorific value. The Aeration Test Burner has proven very useful for controlling the quality of mixed gas in Great Britain and particularly so in seeing that the flame does not become so sharp that flash-backs are likely to occur.

The only Aeration Test Burner that is known of in Canada is one that Vancouver apparently has, and which was mentioned by Mr. Keillor in a paper at the 1938 Convention.

The counterpart of the Aeration Test Burner in the United States appears to be one made by the Rochester Gas & Electric Corporation[1] on which over 200 different gas mixture tests were made from 1938 to 1940 and recorded. The burner tube is ⅜" diameter without a water jacket. The orifice is No. 69 drill size and the gas pressure is regulated to 3 inches water column. The adjustable air shutter is read when the inner cone height is 1 inch. The normal reading of Rochester gas is 69. A reading of 52 indicates backfiring tendencies, while a reading of 86 indicates long flames and yellow tips. In terms of primary air/gas ratios for an average specific gravity, the readings equal a low of 2.4, a normal of 2.7 and a high of 3.0. Readings of the flash-back point were also taken and on the average were a little more than twice the number for a 1 inch cone. However, the graduated scale on the Rochester burner does not start at zero like on the English and Swedish burners, but at some point about minus 100, so that comparisons are complicated. Of the large number of gases tested, two or three have a B.T.U. value just below the 500 mark and the flash-back number of 100 indicates about a 3.4 primary air/gas ratio—the same as on the Swedish instrument.

The Rochester paper shows the same results as already quoted for the English burner, namely that the burner index number drops as coke oven gas is diluted with gases of increasing B.T.U. content. The burner numbers are shown below for a variety of mixed city gases, all of 540 B.T.U.'s.

[1] *See American Gas Journal, December 1940, p. 36.*

**TABLE 1 — PROPERTIES OF FUEL GASES**

| 1 | 2<br>D<br>Specific Gravity | 3<br>H<br>Gross Calorific Value | 4<br>Net H<br>Net Calorific Value | 5<br>H/√D<br>Wobbe Index Number | 6<br>H²/D<br>Square of Wobbe Index x 1000 | 7<br>A<br>Cu.Ft. Air per cu.ft. of gas | 8<br>A/H<br>Cu.Ft. Air per 1000 B.T.U. | 9<br>HA/D<br>A.G.A. "M" Index x 10 | 10<br>A.G.A. "K" Factor | 11<br>Flame Velocity Meters per Sec. |
|---|---|---|---|---|---|---|---|---|---|---|
| Carbon Monoxide | 0.967 | 323 | 323 | 329 | 108 | 2.38 | 7.37 | 79 | 0.445 | 0.395 |
| Hydrogen | 0.069 | 323 | 275 | 1225 | 1503 | 2.38 | 7.37 | 1106 | 2.63 | 1.92 |
| Methane | 0.554 | 1015 | 914 | 1363 | 1858 | 9.53 | 9.39 | 1745 | 0.326 | 0.262 |
| Ethane | 1.049 | 1781 | 1631 | 1740 | 3028 | 16.67 | 9.35 | 2830 | 0.408 | 0.319 |
| Propane | 1.562 | 2572 | 2371 | 2055 | 4230 | 23.82 | 9.28 | 3925 | 0.363 | 0.226 |
| Butane | 2.066 | 3353 | 3102 | 2332 | 5440 | 30.97 | 9.23 | 5020 | 0.370 | 0.290 |
| Ethylene | 0.974 | 1631 | 1530 | 1652 | 2735 | 14.29 | 8.75 | 2393 | 0.980 | 0.695 |
| Propylene | 1.450 | 2336 | 2185 | 1938 | 3755 | 21.44 | 9.19 | 3450 | 0.572 | 0.425 |
| Benzene | 2.692 | 3741 | 3590 | 2282 | 5210 | 35.73 | 9.54 | 4970 | 0.441 | 0.326 |
| Acetylene | 0.911 | 1503 | 1453 | 1577 | 2480 | 11.91 | 7.93 | 1968 | 2.20 | 1.35 |

The above properties have been computed from data in "Combustion" and "Fuel-Flue Gases" Handbooks.

| | |
|---|---|
| Coke oven gas + flue gas | 74 |
| Coke oven gas + producer gas | 73 |
| Coke oven gas + 316 B.T.U., C.W.G. | 67 |
| Coke oven gas + 346 B.T.U., C.W.G. | 62 |
| Coke oven gas + 410 B.T.U., C.W.G. | 58 |
| Coke oven gas + 484 B.T.U., C.W.G. | 43 |
| Straight 549 B.T.U., C.W.G. | 29 |

The explanation is, of course, the decrease in the hydrocarbon content.

The latest test burner to come to my attention is the Flamdicator.[2] This instrument has a fixed air shutter and measures the change in temperature of the burner head. Sharp flames give high temperatures and soft flames low temperatures. Where the Flamdicator is used the normal mixed gas of 800 B.T.U.'s reads 60 and gases with sharper flames are interchangeable in peak load periods provided the reading does not go higher than 200. Straight carburetted water gas of 800 B.T.U's reads 570 and, of course, is not interchangeable.

[2] *American Gas Journal, June 1941, p. 43.*


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## Various Control Methods

If a flash-back testing instrument is not available, other means can be employed for gas control. The specific gravity is commonly used for this purpose and may prove quite satisfactory where just one plant is involved, but it is not satisfactory where the mixture is composed of horizontal retort coal gas and vertical retort steamed gas, both mixed with carburetted water gases, as my observations have shown that there is no worthwhile relationship between specific gravity and flash-back index numbers for such conditions.

The calorific value is another property that might be considered. Chart No. 1, however, shows that there is only a rough relationship between B.T.U.'s and flash-back index numbers. For instance, the chart shows that a mixed gas of 475 B.T.U.'s might have a F.B.N. of 24½ which would be in the satisfactory region, while another gas with more carbon monoxide and less hydrocarbons and inerts of 485 B.T.U.'s might have a F.B.N. of just 23½, which would place it in the flash-back area where trouble could be expected.

The diagonal line passing through the centre of the points has the equation FBN = 0.5 × BTU — 216 or BTU = 2 × FBN + 432. In other words 1 index number on the Swedish instrument equals, approximately, 2 B.T.U.'s. The B.T.U.'s can drop from 486 to 480, 1.23%, or rise to 494, up 1.64%, before trouble can be expected according to this equation.

Combining the calorific value with the specific gravity gives us the relative rate of thermal flow, or the Wobbe index number $H/\sqrt{D}$, as it is called in Europe after G. Wobbe of Germany, who apparently suggested its use as a control factor in 1926. This factor allows more latitude in the calorific value if it is compensated for by a corresponding change in the specific gravity. There is also an improvement in the relationship with the flash-back index number. An average equation connecting the two is FBN = 0.183 × Wobbe Index — 96 and conversely Wobbe Index = 5.47 FBN + 525. The Wobbe Index can drop from a normal of 672 to 656, down 2.5%, or increase to 694, up 3.3%, before trouble can be expected. The Wobbe index for most fuel gases is around 1500 (see column 5 in table 1) with the exception of carbon monoxide, which has a number of just 329. This comparison checks with the results

of adding different gases and reading the flash-back number directly (see chart No. 2), and should pretty well prove that carbon monoxide is the bad boy in the flash-back field. Benzene and butane on the other hand, if in considerable amount, are the gases mostly responsible for producing long flames and yellow tips.

Notwithstanding the importance given the Wobbe Index Number in Europe, it has three bad faults. It does not consider the theoretical air required for combustion or flame velocity, and any control limits set must of necessity be rather narrow for the simple reason that the two above mentioned essential properties are not included. The first fault is corrected in the A.G.A. index M which is equal to HA/D where A is the theoretical cu. ft. of air required per cu. ft. of gas. Inasmuch as the ratio A/H is low (see column 8) for carbon monoxide and hydrogen, this index number indicates the true characteristics of these two gases even better than the Wobbe index, and increases the spread between carbon monoxide and the other gases. The computed limits for the index M, comparable to the previous two already given, are down 7% and up 10%.

The disadvantage of using the M index number is that it requires an analysis of the gas to determine A. However, for rough calculations A can be assumed proportional to H and the factor becomes $H^2/D$. Since this is the square of the Wobbe index it has no advantage over it. The limits are equal to the square of the Wobbee index and become, down 5.0% and up 6.7%.

An improvement over the M index is the A.G.A. C index which equals the M index minus a K factor for flame velocity. This K factor is, roughly, proportional to the flame velocity in meters per sec. and the way it modifies the M index is to lower it when the hydrogen or ethylene content of the gas is high and to raise it when the methane content of the gas is high. It will be seen that the K factor for carbon monoxide is just about average while the K factor for ethylene is much higher, yet carbon monoxide is the constituent that causes flashbacks. This shows that actual burner operation bears no more relationship to the K factor than to flame velocity so, for this reason, the K factor should not be used alone but only in conjunction with the M index to give the well known A.G.A. interchangeable formula in which the index C is determined. The A.G.A. recommended limits for C are down 15% and up 15% from the adjustment point. Since manufactured gases of less than 500 B.T.U.'s per cu. ft. are susceptible to flash-back, it is recommended by the writer that where a drop in the C index of 15% from a normal gas does not prevent flash-backs, that the 15% be reduced to 10% to see if the flash-back trouble can then be eliminated. The A.G.A. formula has the effect of taking hydrogen away from the hydrocarbon group where it was placed by the Wobbe index number and putting it beside carbon monoxide to give two short flame gases. Unfortunately, the complications involved in computing the C index do not allow it to be determined for individual gases. However, Table No. 1 shows all the other index factors.

Chart No. 2 showed that as far as the flash-back index number is concerned both carbon monoxide and hydrogen behave like the inert gases. This led to a search for a relationship between the hydrocarbons, the only constituents remaining, and the flash-back numbers. The relationship turned out to be a straight line equation as follows: FBN = 1.75 × hydrocarbon content — 12. Thus an average manufactured gas having about 22.3% hydrocarbons by volume can vary downward to 20.5% or upward to 24.6%. This is a very significant equation because here we see why the flash-back number differs from the calorific value. In heat calculations the calorific value of carbon monoxide and hydrogen must be added to that of the other fuel gases but in research work on flash-backs with fuel gases and bunsen type burners, the carbon monoxide and hydrogen in the mixture must be grouped with the inert gases, nitrogen, carbon dioxide, oxygen and water vapour. Hydrocarbons in the above equation refers to methane plus the illuminants only, as what effect propane or butane would have has not been determined.

By operating the Swedish instrument to give a fixed cone height (the Aeration Test Burner Method), we were enabled to arrive at, approximate ATB variations for a manufactured gas. Operating the instrument with a fixed air shutter (the Hofsass Method) produced differing cone heights which appeared to have the following relationship to the flash-back number of the gas:

Cone Height = 0.125 × FBN — 2.4.

Table No. 2 is a summary of all the control factors discussed with the permissible variations from the mean value listed in the order of increasing magnitude.

**Table No. 2—Control Factors**

| *Method* | % *Decrease* | % *Increase* |
|---|---|---|
| Specific Gravity | Doubtful | Doubtful |
| Calorific Value | 1.23 | 1.64 |
| Wobbe Index Number | 2.5 | 3.3 |
| Lanphier Caloroptic | 2.5 | 3.3 |
| $H^2/D$ (Square of Wobbe) | 5.0 | 6.7 |
| HA/D (A.G.A. M Index) | 7 | 10 |
| Hydrocarbon Content | 8.1 | 10.3 |
| Aeration Test Burner | 10 | 13 |
| A.G.A. C Factor | 10 | 15 |
| Swedish Flash-back Number | 11 | 15 |

In using this list it is obvious that the methods at the top are the least favorable and those at the bottom the most favorable because of the latitude allowed. In every case one or more instruments must be used and, therefore, the choice of method depends upon the instruments available. In addition to allowing a wide latitude the Swedish instrument speedily and easily, without mathematical calculations, moulds all the variable factors into one numerical reading. It seems to the writer that there is a very great need for the standardization of some such instrument.

## What Should a Test Burner Measure?

For fuel gas to be satisfactorily burned in a bunsen burner, it is required that the thermal input per square inch of port area be within certain limits, depending on the port size and type of gas, also the amount of primary air injected by the gas should be within certain limits. Chart No. 3 shows these limits for a mixed coal gas and carburetted water gas of about 490 B.T.U.'s. For satisfactory adjustment the gas and air rates must intersect at a point inside of the four limits of flash-back, blow-off, CO or incomplete combustion and yellow tips. For instance, low gas rates are limited by the flash-back curves, high gas rates by blow-off or incomplete combustion curves. Low primary air rates are limited by yellow tips and possibly incomplete combustion while high air rates are limited by either the flash-back or blow-off curves, depending upon whether the corresponding gas rate is low or high.

Observations made with the Swedish instrument and the Caloroptic

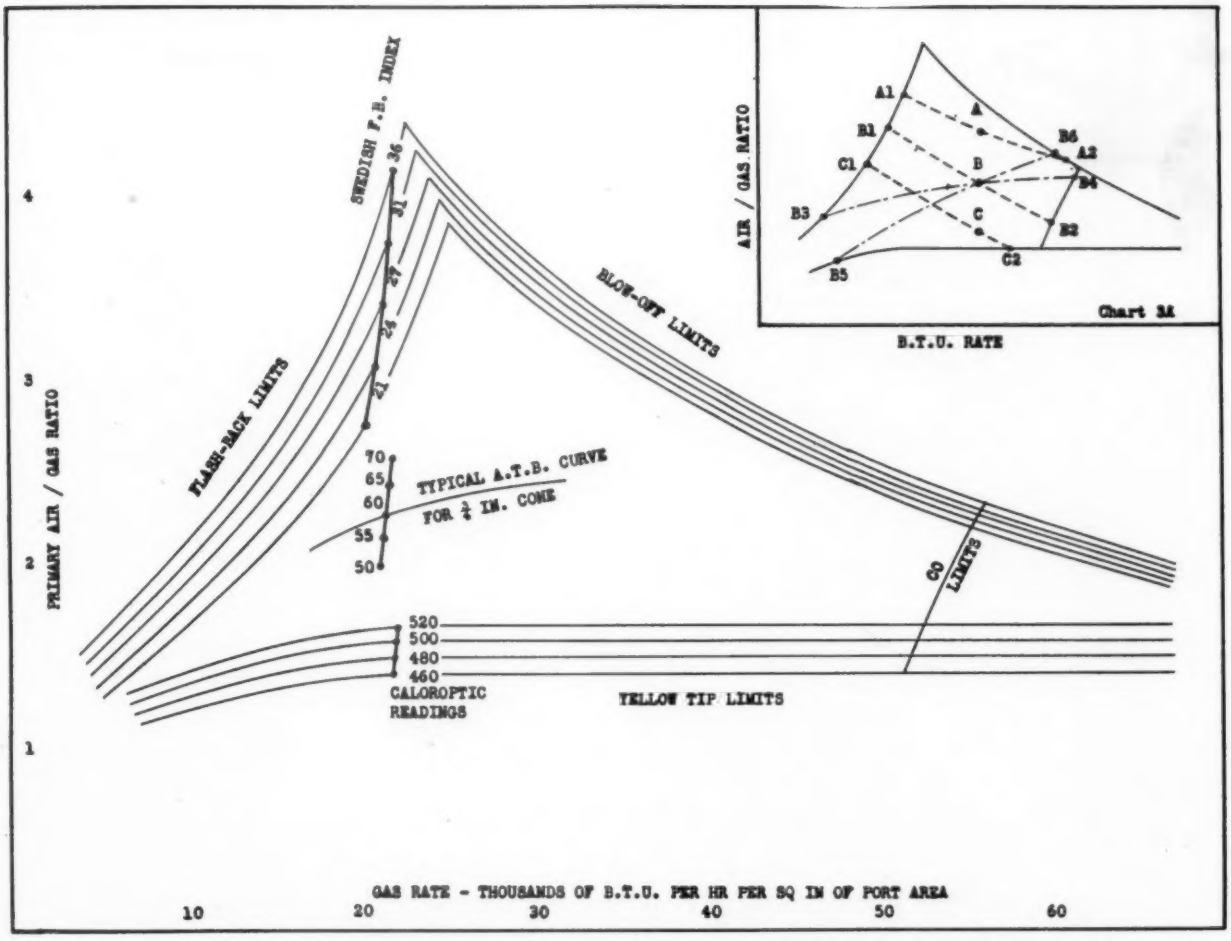



Chart No. 3—Typical diagram of the operating characteristics of bunsen burner on manufactured gas.

Chart No. 3A—The effect of changes in gas composition on burner adjustment.

have given definite points for the plot of the flash-back and yellow tip curves. The blow-off and CO limits were not actually determined, but are filled in, to complete the diagram, from information found in various American and British gas publications of recent years. Likewise, the typical Aeration Test Burner Curve is only estimated but will be accurate enough for the practical purpose of showing what gas property each of the three test instruments measures. It should be understood that the position of the curves depends on the port size and that these curves are for the port sizes on the test instruments which are large and, therefore, more sensitive to gas changes than ordinary burners. The CO curve is also dependent on the appliance design, especially the combustion space and head room over the ports.

The gas rate is very important too, because it will be seen that if the port loading had been increased from about 20,000 B.T.U./hr./sq. in. of port area (the approximate loading for all three test burners mentioned) to 30,000 the gases would not flash-back but instead would blow away from the ports. The other two instruments would continue to record the position of a ¾ in. cone and yellow tips and, therefore, do not appear to be as valuable as the Swedish instrument for detecting differences in gas quality. One improvement that might be made to the Swedish instrument would be to substitute a volume regulator for the pressure gauge as this should bring the line connecting the flash-back index points more vertical whereas now it slopes to the right and parallels the limit curves, which means that points above 30 on the scale are not so sharply defined as the low points.

The chart shows that as the flash-back number of the gas drops, the limit curves are displaced to the right making the usable area for good adjustment smaller; the same is true when the Caloroptic readings increase. The blow-off and CO limit curves are also altered with gas changes. Possibly the blow-off curves, as shown, should be reversed to bring the high flash-back curve to the inside as it is known that gases high in methane, such as natural gas, have the blow-off limits also the flash-back limits displaced considerably to the left, making the working area for natural gas quite small.

Considering only the flash-back curves, it will be seen that if any burner were originally adjusted close to one of the curves and then the gas changed to a lower flash-back number, the adjustment point might now be in the flash-back area. Serious as this may be, it is only half the story as the other half is shown separately, for sake of clearness, in the inserted chart 3A. It so happens in about 9 out of 10 cases that a drop in F.B.N. readings also means a drop in burner loading in B.T.U./hr./sq. in. of port area and also a rise in the primary air/gas ratio. This makes matters very much worse because now not only does the flash-back limit line come in toward the adjustment point but the point goes out to meet the line.

To study how gas changes cause trouble, let us add a couple more

*(Continued on page 44)*

# Pipe Line Protection—What Does It Cost?

By
**Stanley A. Wright**
Asst. Division Supt.
Pacific Gas & Elec Co.

THIS PAPER is a brief discussion and summary of operating costs for the past five years of eight Cathodic Corrosion Eliminators (a) (Rexselen).

In 1929 and 1930, when the major portion of the Pacific Gas and Electric Company system was converted to natural gas, it was necessary to lay approximately 45 miles of 12" and 8" H.P. gas main to serve the central coast portion of the system.

The great variety of soil conditions and the topography traversed by this line made electrolytic and soil corrosion trouble a serious problem for the future. The line makes submarine crossings under one river and five streams that are wet the year round. It crosses two ranges of hills with maximum elevations of 1,140' and 450'. The last mile of line is practically at sea level and portions of this main are actually below high tide level which means that the pipe is buried in wet soil saturated with salt throughout the year. Also, several miles of this line are adjacent to fields that are heavily irrigated during the dry season.

You will immediately recognize these conditions as very conducive to rapid pipe line deterioration from both electrolytic and soil corrosion.

The pipe was all single wrapped which fact offered a good opportunity for the application of electrical mitigation methods if it should prove economically feasible. Surveys were made to determine the capacities and locations of possible rectifying units. These surveys covered a period of about three years and consisted of soil samples to determine soil corrosivity, pipe line currents, current discharge and pick-up from and to the pipe, and finally the use of corrosion coupons which gave an indication of actual corrosive activity along the line over a period of time.

From these surveys, eight Cathodic Corrosion Eliminators were located along the line.

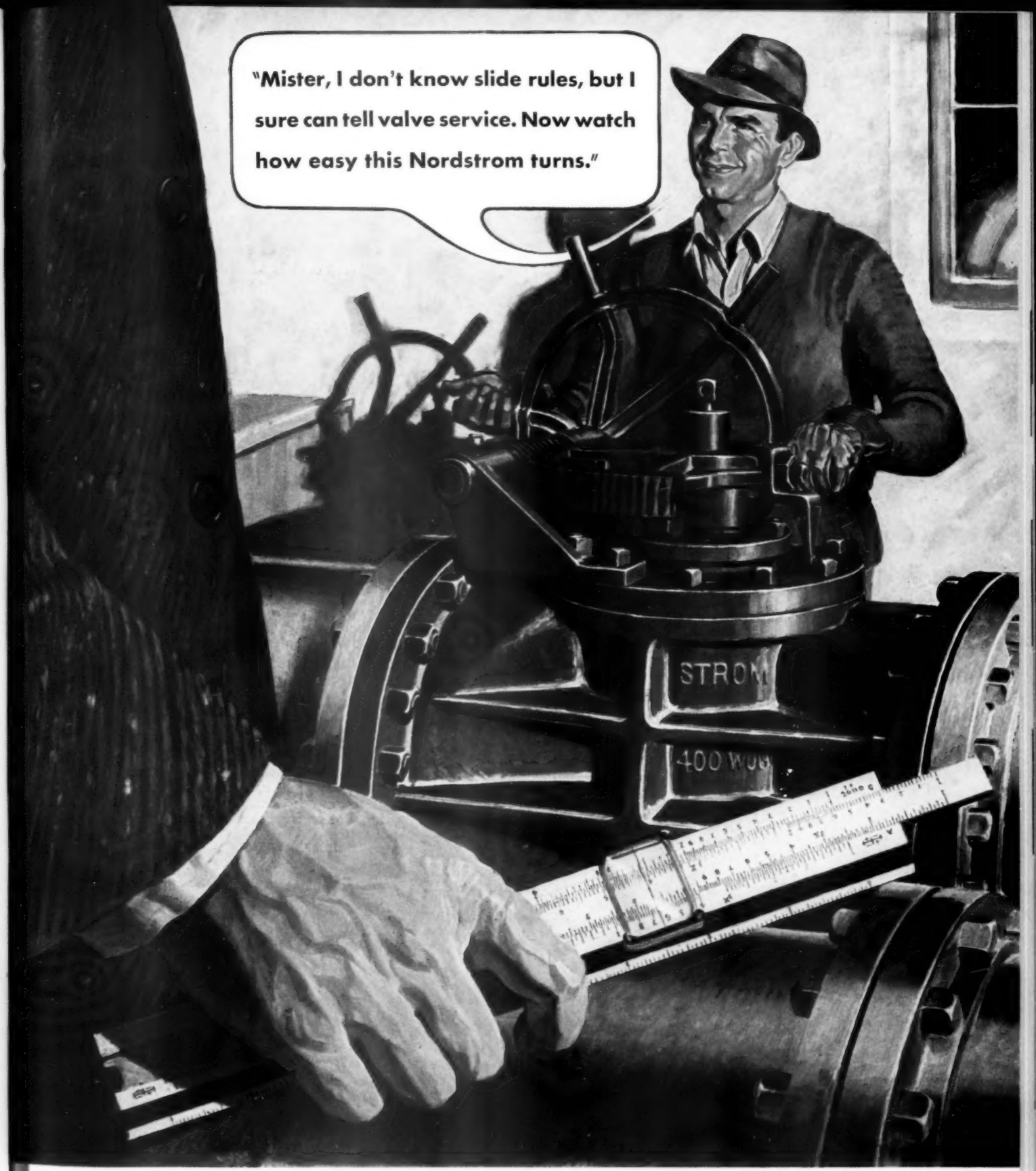
Only 28 miles of the 45 miles of line is protected electrically. In general, the remainder of the line is subjected to such mild soil and electrolytic conditions that cathodic protection was considered uneconomical as this portion of the pipe has an estimated life of 50 years or more. $2,500.00 was spent on these sections of the line to apply a protective coating of one inch of asphalt around the main in sections varying from 50' to 250' where the pipe crossed under streams or through wet soil conditions. With this expenditure of $2,500.00, together with the $7,083.00 that the eight Cathodic Corrosion Eliminators cost installed or $9,583, we believe that the maintenance and repair on this 45 miles of H.P. main due to soil and electrolytic corrosion has been reduced to a negligible figure for the life of the pipe line which we estimate will be over 50 years. This 45 mile pipe line and accessories represents a capital investment of $650,000.00 and the replacement cost

OPERATING DATA AND ANNUAL COSTS
FOR EIGHT CORROSION ELIMINATORS (Rexselen)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Unit No. | Unit Rating Amps. | Miles Protected | Pipe Size | Power Consumed Yearly Ave. KWH | Power Cost Yearly Ave. $ | Power Cost Per KWH $ | Output Yearly Ave. KVAH | Output Cost Per KVAH $ | Efficiency KVAH/KWH % | Investment $ | Depreciation $ | Interest on Investment $ | Taxes $ | Operating Costs $ | Maintenance $ | Annual Costs Total $ |
| 1 | 15 | 2.4 | 12" | 540 | 31.70 | .059 | 294 | .108 | 54 | 991 | 42.58 | 59.46 | 19.82 | 40.00 | 60.00 | 253.56 |
| 2 | 15 | 2.5 | 12" | 691 | 37.50 | .054 | 406 | .093 | 59 | 964 | 41.42 | 57.84 | 19.28 | 40.00 | 60.00 | 256.04 |
| 3 | 15 | 5.0 | 12" | 1,431 | 62.80 | .044 | 714 | .089 | 50 | 952 | 40.91 | 57.12 | 19.04 | 40.00 | 60.00 | 279.87 |
| 5 | 15 | 2.0 | 8" | 983 | 38.20 | .039 | 475 | .081 | 48 | 816 | 35.06 | 48.96 | 16.32 | 40.00 | 60.00 | 238.54 |
| 5A | 15 | 6.0 | 8" | 858 | 35.42 | .041 | 410 | .086 | 48 | 824 | 35.41 | 49.44 | 16.48 | 40.00 | 60.00 | 236.75 |
| 6 | 15 | 1.7 | 8" | 1,242 | 47.87 | .039 | 678 | .071 | 55 | 760 | 32.66 | 45.60 | 15.20 | 40.00 | 60.00 | 241.33 |
| 7 | 15 | 1.5 | 8" | 833 | 31.08 | .037 | 389 | .080 | 47 | 850 | 36.52 | 51.00 | 17.00 | 40.00 | 60.00 | 235.60 |
| 4 | 20 | 5.4 | 12" | | | | | | | | | | | | | |
| | | | | 1,351 | 47.90 | .037 | 694 | .069 | 51 | 926 | 39.79 | 55.56 | 18.52 | 40.00 | 60.00 | 261.77 |
| | | 1.6 | 8" | | | | | | | | | | | | | |
| TOTAL | 8 | 28.1 | | 7,929 | 332.47 | | 4,060 | | | 7,083 | 304.35 | 424.98 | 141.66 | 320.00 | 480.00 | 2,003.46 |
| AVE. | | | | 991 | 41.59 | .044 | 508 | .085 | 52 | 889 | 38.04 | 53.13 | 17.71 | | | |

Explanation of Data

Column: 4 This pipe is all single wrapped with Paboo wrapping material.
5 This A.C. power consumption is the average kilowatt hours consumed annually over a five year period.
6 This power cost is the average annual cost over a five year period using the regularly established rate applicable to this type of use.
8 The out-put of these units is the average over the five year period of the monthly reading of the D.C. indicating voltmeter and ammeter multiplied by 8,760 hours in the year.
10 The efficiency of these units is the output (kilovolt ampere hours divided by the in-put - kilowatt hours). The average annual values were used.
11 The investment is the total installed cost of the complete Cathodic Corrosion Eliminator.
12 The depreciation as represented is that based on an assumed life of the entire installation as being 15 years.
13 The interest on the investment was taken as the usual 6%.
14 Taxes are represented as 2% of the investment.
15& No accurate record of the operating and maintenance costs is available. The amounts used
16 are from experience believed to represent a fair estimate of the true charges.
17 The total annual cost for each unit is made up of the charges in columns 6, 12, 13, 14, 15 and 16.



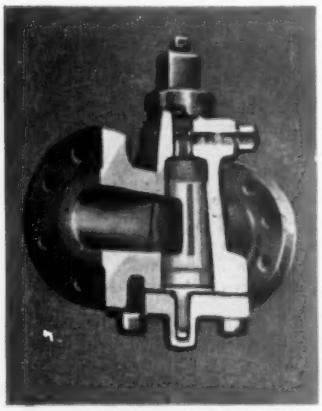

Whether by slide rule theory
or actual field service

NORDSTROM VALVES *set the pace!*

# Your VITAL FLOW LINES *Keep'em flowing!*

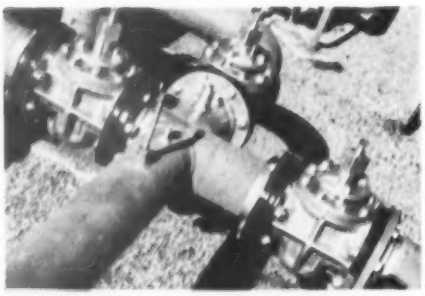
**KEEP UPKEEP DOWN WITH NORDSTROM VALVES**

*Leaking valves are the saboteurs of production. Keep flow lines flowing by installing positive-action, positive-sealing Nordstrom Valves. They are good defense weapons, and most economical, too!*



**HYPRESEAL TYPE**

**Developed for highest working pressures and for severe services in general, regardless of pressure. The Hypreseal can be repacked while under full line pressure, with plug in any position.**



Standard Nordco Steel Valves on butane lines.

**A VALVE CHECK-UP NOW MAY SAVE THOUSANDS OF DOLLARS LATER**

Needless to say, the demand for Nordstrom Valves exceeds that of any previous year. While every effort is being made to fill customers' needs, the most urgent defense orders must have right-of-way.

So we suggest that you check your valve needs for months to come *right now!*

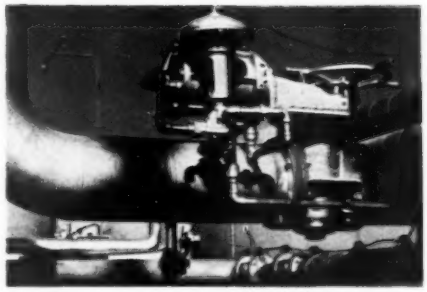
Nordstrom field engineers will gladly assist you in determining what valves will require replacement. They may be able to suggest more economical arrangements of piping or recommend valve hook-ups that will enable you to use fewer valves than in the past.

If you are having any valve trouble it should be immediately corrected to avoid possibility of a shut-down in the critical days ahead.

» » • « «

NOW, AS NEVER BEFORE, YOU NEED FULL PRODUCTION, BOTH IN YOUR PLANT AND OUT IN THE FIELD! NOW, AS NEVER BEFORE, YOU NEED THE ENDURING RELIABILITY THAT ONLY NORDSTROM LUBRICATED VALVES CAN GIVE!

*Descriptive Bulletins upon request.*



Nordstrom Cylinder-Actuated, Gear-Operated Valve on gas line.

**SIMPLE DESIGN OF NORDSTROM VALVES ASSURES LOWEST MAINTENANCE COSTS**

When you compare Nordstrom construction with that of any other valve, note the simplicity—an inherent Nordstrom feature.

A lubricated, tapered, ever-seated plug is used instead of a gate which must be unseated. A quarter-turn of the plug completely opens or closes the valve. This fast action saves the operator's time. He can, in many cases, close several Nordstroms in the same time needed to completely close an ordinary valve.

None of the line contents can contact the valve seat. The plug is seated on a pressure film of lubricant which the line contents cannot penetrate. Gases can't leak around the ports because the latter are surrounded by a circuit of high pressure sealing lubricant. If the line contents are slurries, mud or other corrosive or erosive substances, they can't penetrate this pressure seal. The film of lubricant between the plug and body plus the pressure lubricant circuit around the ports form an effective barrier against leakage internally or externally.

Consequently, Nordstrom Valves are used for services where no other valves can satisfactorily perform—particularly on mud lines in oil well drilling, on artificial and natural gas lines, butane lines, acid lines in chemical plants and for handling hydrocarbons of highest temperature and pressure.

**MERCHROME COATED VALVES**

For services where extremely corrosive and erosive conditions prevail, such as mud lines, hot gases or chemicals, Nordstrom *Merchrome Coated* Valves are used. The plug and seating surfaces of the body are hard-faced with an armored welded coating that is practically indestructible.

# Nordstrom LUBRICATED VALVES

*Sealdport Lubrication*

**MERCO NORDSTROM VALVE COMPANY** – *A Subsidiary of Pittsburgh Equitable Meter Company*

WORLD'S LARGEST MANUFACTURERS OF LUBRICATED PLUG VALVES; GASOLINE, OIL & GREASE METERS

*Main Offices:* 400 Lexington Ave., Pittsburgh, Penna. • *Oakland (Calif.) Factory:* 2431 Peralta St.

*BRANCHES:* Boston, Brooklyn, Buffalo, Chicago, Columbia, Des Moines, Houston, Kansas City, Los Angeles, Memphis, New York City, Philadelphia, Pittsburgh, San Francisco, Seattle, Tulsa.

*CANADIAN Licensees:* Peacock Bros., Ltd., Montreal. • *EUROPEAN Licensees:* Audley Engineering Co., Ltd., Newport, Shropshire, Eng. *SO. AMER. Rep.:* The Armco International Corp. • *Office:* Middletown, O.

**PRODUCTS:** Nordstrom Lubricated Valves; Air, Curb and Meter Cocks • Nordco Valve Lubricants • EMCO Gas Meters • EMCO-McGaughy Integrators EMCO Regulators • Pittsburgh-National Meters for Gasoline, Grease, Oil, Water and other Liquids • Stupakoff Bottom Hole Gauges

of that 28 miles which is cathodically protected is conservatively estimated at $300,000.00. The additional investment of $7,083.00, or slightly over 2% of the pipe line investment to extend the life of the pipe from 2 to over 10 times its original life expectancy was manifestly a good investment.

Of course, the original cost of the protective units is but part of the answer. What does it cost to operate the units or what are the annual charges? The data on the attached table gives this information in detail for each of the eight eliminators. This tabulation was made to enable anyone interested in analyzing the record of each unit separately.

A few comments will clarify the figures in the data columns. The power costs are the actual watthour meter readings computed at the regularly established rate for this class of service. The difference in cost per KWH for the first three units and the other five is accounted for by the fact that the first three units are in the territory of neighboring utility and the power used is billed on a lighting schedule. The other five units are on our own lines and are billed on a power schedule.

The kilowatt ampere hours in column 8 are of necessity computed from the monthly readings of the indicating instruments in the unit as there are no recording instruments in the D.C. or out-put side of the circuit. These figures give a fairly accurate picture, however, as the D.C. voltage and ampere values stay within a very close range from day to day.

As indicated, the efficiency of the units given is the volt ampere out-put divided by the watt in-put. The reason for this is that we are not interested in the power out-put as it is D.C. amperes that accomplished the protective work.

For simplicity and because we do not know exactly what future pilot pipe trouble we may have, the conservative figure of 15 years has been used for depreciation calculations in column 12. These units are all equipped with cast iron pilot pipes. Because of the tendency of cast iron to change to graphitic iron (c), under these conditions, we may have to replace some or possibly all of these pilot pipes. Likewise, there is not much information as to the probable life of the Rexselen elements. However, in over five years of service, it has not been necessary to replace or in anyway service the elements in any of the eight units. Accepting the doubtful life of the cast iron pilots and unproven longevity of the selenium elements, fifteen years is considered a conservative period for amortization of the investment.

The operating and maintenance charges in columns 15 and 16 are considered liberal, as in the case of most of our units, the monthly D.C. readings are made by the meter reader.

Summarizing, it has cost an average of $2,003.46 per year over the past five years to operate these eight Cathodic Corrosion Eliminators that protect 28.1 miles of H.P. gas main. This main represents an investment of over $300,000.00 so the annual costs are less than 1% of the original investment in pipe line.

(a) See "Comparative Costs of Cathodic Corrosion Protection Equipment" by W. R. Schneider, P. C. G. A. Proceedings 1939.

(b) See "Corrosion Coupons and Pipe Life Predictions" by W. R. Schneider, P. C. G. A. Proceedings 1941.

(c) See "Electrical Connections to Graphitic Iron Pilot Pipes or Ground Electrodes" by Merritt H. Brady, P. C. G. A. Procedings 1939.

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*Presented at the Spring Technical Conference, Pacific Coast Gas Association, Los Angeles, May 21-22.*

In This—the Great Emergency—
CLEVELANDS
As Always—Are Coming Through
When there's ditch to dig—or fill—you'll always be glad you bought a "CLEVELAND."
Keep them in fighting trim by regular attention to maintenance and lubrication.
THE CLEVELAND TRENCHER COMPANY
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"Pioneer of the Small Trencher"
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"CLEVELANDS" Save More . . . Because they Do More

**RODA** — High grade gas, by-product and steam coal from Wise County, Va., on the Interstate Railroad.

**DENDRON** — High grade gas, by-product, steam and domestic coal from Wise County, Va., on the Interstate Railroad.

**STONEGA** — High grade, high volatile steam and by-product coal from Wise County, Va., on the Interstate Railroad.

**PREMIX** — A laboratory controlled product blended to meet exacting stoker requirements. From Wise County, Va., on the Interstate Railroad.

**COKE** — Roda and Stonega from Wise County, Va., and Connellsville Coke from Pennsylvania.

**CRITERION COAL** — High grade gas, by-product, steam and domestic coal—Pittsburgh seam from Irwin Basin, Westmoreland County, Pennsylvania, on the Penna. Railroad.

**CROZER** — Genuine Third Vein Pocahontas from McDowell County, W. Va., on the Norfolk & Western Railroad.

**Admiralty Coal** — Genuine New River Smokeless, Beckley or Sewell seam from Raleigh County, W. Va., C. & O. and Virginian Railroads.

**Old Kentucky** — Hazard No. 4 and No. 7 steam and domestic coal from Wiscoal, Knott County, Kentucky, on the L. & N. Railroad.

**GENCO** — Steam and domestic coals from a number of producing districts.

**ANTHRACITE** — Premium and standard qualities in the entire range of Anthracite burning characteristics.

Capable engineering personnel and the experience gained through long and varied marketing activity assures proper application of one of the above brands and effective servicing of any fuel requirement.

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# Some Critical Problems in Our War Effort

By

**A. A. Potter**

Dean of Engineering,
Purdue University

THE Indiana Gas Association has been most generous to Purdue University. For about fourteen years your Association has encouraged us in our investigations of gas utilization devices, and I am confident that through the findings in our laboratories you have contributed to public welfare.

During the past year Mr. R. E. Howard of the Purdue University Engineering Experiment Station, under the able leadership of Dr. J. L. Bray, Head of the School of Chemical Engineering, has given major attention to the following problems:

**High B.t.u. Manufactured Gas.** To protect the public from a possible shortage of natural gas, an effort is being made in our laboratories to develop a practical process for producing a high B.t.u. gas approximating natural gas in composition. Equipment for high temperature and high pressure operation is being developed in order to utilize the hydrogenation of coal method in attaining the objective. Thus far, gases containing 70 per cent methane and 20 per cent hydrogen (Heating value 760 B.t.u. per cubic foot) have been obtained. Difficulties in securing materials because of priorities are delaying this project. Up to date only pressures of 4200 pounds and temperatures of 1100° F. have been used. The plan is to go to higher temperatures and pressures as soon as suitable equipment is available.

**Gas Utilization.** In connection with gas utilization problems the following investigations have been conducted:

(a) **Filters.** To enable the service man to specify the required filter for a given rate of gas flow and with a minimum pressure drop an investigation of sponge filters is under way.

(b) **Substitute Materials.** To meet shortages in galvanized piping and flexible connections for gas range installations synthetic tubing is now undergoing field tests.

(c) **Appliance Regulations.** A study is being made to determine the pressure variations at gas appliances of varying conditions of gas pressure in the distribution system.

It is hoped that the above investigations will prove helpful to gas users during the present emergency.

While our peace time interests are concerned with the utilization of the findings of science and of economics in order to provide better ways for satisfying human needs, our main task at present is to insure a victory in the war effort of the United Nations. An appraisal of the critical problems in our war effort can be made only after the following questions are answered:

**Why Are We At War?** Nine years ago, or in the spring of 1933, Hitler declared war on human decency, individual liberty, and on the other ideals which made America what it is, when he announced in his *Mein Kampf* his ideology of nazism and his plans for a new world order. Any thinking person should have realized long before the Munich Conference that totalitarian ideology and American idealism cannot live side by side. Where the nazis and their cohorts stand for lies, slavery, and arbitrary gangster rule, this great country of ours and its people believe in truth, liberty, and law. Where the Japs and Germans encourage the worst type of sadistic cruelty and limit opportunities to the members of their gangs, our land has always stood for humanity, tolerance, and equality of opportunity. Where our unscrupulous enemies stand for government by cruel and dishonest dictatorship which has no respect for human or property rights, our people have a government by consent of the governed with individual rights guaranteed by our Constitution. The war in which we are now engaged is a matter of life and death for liberty, humanity, and honor.

**Could We Have Kept Out of the War?** It is true that our country is made up of peaceful people who thought they had no quarrel with any other people. Neither did the people of Czechoslovakia, Denmark, Norway, Greece, Holland, Belgium, China, and of the other unhappy countries of today want war. The people of those countries, like the Americans, wanted to be left at peace but were given no choice. Hitler and his cohorts pay no attention to international law and have picked their victims one by one, and their terrible plan worked because each unhappy victim nation believed it was not on the list, as "it had no quarrel with Hitler." Were we given any choice when the unscrupulous Japs attacked us at Pearl Harbor?

This country was bound to be attacked by the Japs and the Germans, as our land is blessed with great natural resources which the international gangster bands wanted. Our enemies, however, do not realize that natural resources alone are of little value in raising the standards of living of a nation unless its people have character, industry, idealism, and creative ability to utilize material resources for the benefit of humanity. Our own high standards of living are due partly to the wealth of our national resources, but must be mainly attributed to our foresighted government which has encouraged individual enterprise and creative ability.

There is no way to stop such gangster bands from depriving our people of their human rights as well as their property except through war. There can be no peace with gangsters and racketeers who are bound to undermine that which is noble and holy in human conduct.

**What About Our Relations to England and Russia?** It is a well-known fact that, had England been invaded in the spring of 1940, this country would have been at war with both Japan and Germany in the fall of 1940. England, by defending the British Isles so courageously, has given us more than a year to prepare, at least in part, for the conflict in which we are now engaged.

As to Soviet Russia: It must be remembered that it is helping us and our friends in our fight against Japan and Germany. While few of us have much respect for the communistic totalitarianism, it is poor taste for us to criticize Russia's past conduct. David Cushman Coyle, in his book *America*, when referring to Russia made this pertinent observation: "When you need your neighbor's help in resisting a gangster, you do not

need to convince yourself of your neighbor's character."

**What Factors Contribute to Victory in Modern Warfare?** Modern mechanized warfare is a test of the engineering, scientific, and manufacturing skills of nations. New, scientific techniques, new machines, and new materials have to be developed, designed, constructed, and adapted to serve military, naval, and civilian objectives. Our war effort requires for its effectiveness millions of skilled workers, as well as large numbers of engineers, scientists, and production executives.

**Training for Victory.** Early in the summer of 1940 it became apparent that there is bound to be a shortage of skilled workers. Since July 1, 1940, Congress has appropriated 163 9/10 million dollars for a defense training program of "less than college grade" which involved courses of vocational type which could best be given by the staffs of our public trade and vocational schools. This program has benefited our war effort by affording specialized trade and vocational instruction to over two million people, employed workers as well as those untrained people who have had to be added to industry.

Those in contact with defense industry as well as with the armed forces realized more than 1½ years ago that there is bound to be a great shortage of engineers and production supervisors. As more and more defense contracts have been awarded, the situation with reference to engineering and supervisory talent becomes very critical. In modern mechanized warfare engineers are needed in large numbers for the effective planning, design, and large scale manufacture of guns, tanks, explosives, ammunition, airplanes, and naval vessels. Engineers are the key people in connection with the design and construction of new factories, cantonments, fortifications, air bases, naval bases, sanitary systems, and air raid protection shelters. Engineers must provide additional sources of power and water, enlarged transportation and communication facilities, and must be ready to cooperate with scientists in making available increased supplies of raw materials which are scarce by reason of priorities and allocations.

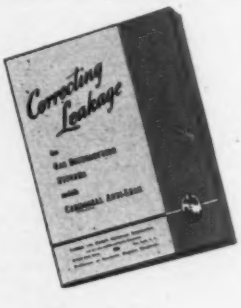
Starting with only about one-half million of defense workers in July, 1940, the number of those employed in defense industries rose to over five millions by January, 1942, and it is expected that our war industries will employ nearly 15 million by January, 1943. In considering a defense contract, which is largely engineering in character, industry looks to the engineers as the key men who, like those in the general staff of the Army, direct the actual war goods output. Relying upon their technological knowledge engineers can take an armored tank job, bomber assignment, or any other production contract and quickly plan the design and outline methods of speedy production. The fact that two to six per cent of all employees in defense industries must be comprised of individuals who are dealing with engineering and supervisory problems, indicates the magnitude of the task when only about 300,000 graduate engineers are available in the entire country to fill civilian needs, those of the defense industries and those of the armed forces.

In addition to tens of thousands of additional engineers needed by our war industries, the urgent needs of the armed forces and of Civil Service are at least four times the annual output of all engineering colleges of the country, which is only 12,000 to 14,000.

Engineering colleges all over the country are changing to continuous


# You Save in 4 WAYS When You Use "CARBOSEAL" ANTI-LEAK

*. . . for Long-Term Correction of Dry Bell-and-Spigot Joint Leakage*




*It will pay you to investigate*

You too can do what others have already accomplished with "Carboseal" Anti-Leak treatment. Plan now to start using this accepted method for reducing your unaccounted-for-gas loss . . . This 20-page book tells more about "Carboseal" Anti-Leak treatment—how it can be applied by either the gravity or the hose method, how much it costs, and what results can be obtained. Write for a copy today, without obligation.

*1. You Save Labor*

The application of "Carboseal" Anti-Leak requires only a few filling connections on the main—four per mile is the average. Costly and time-consuming excavation and repaving are almost entirely eliminated. Only a small crew is required.

*2. You Save Critical Materials*

Quantities of steel and rubber—both required in the mechanical method of correcting bell-and-spigot joint leakage—are not needed in the "Carboseal" Anti-Leak chemical treatment.

*3. You Save Gas*

In typical applications in dry gas systems "Carboseal" Anti-Leak reduced unaccounted-for gas 60 per cent . . . 85 per cent . . . in many cases, 100 per cent.

*4. You Save Money*

The experience of 16 users who treated over 200 miles of main indicates that the average cost of "Carboseal" Anti-Leak treatment is about 50 cents per joint . . . a fraction of the cost of leakage correction by other means.

CARBIDE AND CARBON CHEMICALS CORPORATION

*Unit of Union Carbide and Carbon Corporation*

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PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS

operation, with three 16-week terms or four 12-week quarters per year in order to make their graduates available earlier for contribution to our war effort. This accelerated program, however, will not add materially to the numbers of engineers even if larger numbers of high school graduates are encouraged to enter engineering colleges.

The shortage in engineering, scientific, and supervisory personnel is being met largely by special intensive courses on the college level which are being offered at the cost of the Government. About 90 per cent of these courses are in-service programs for those now employed. About ten per cent are intensive full time courses six to 16 weeks in duration for the training of inspectors and other specialists, and for the benefit of those who are being prepared as technicians or assistants to engineers. Between January and August, 1941, over 107,000 people received this training at a cost to the Government of about seven million dollars. This year's program is intended to benefit about 550,000 people and will involve a cost of about 27½ million dollars. While this program is helpful in training and retraining engineers, physicists, chemists, and production supervisors for new technical and supervisory tasks, it is not a substitute for a regular college program. However, as more and more of the 160.4 million dollars now obligated for our war effort are being translated in industrial contracts and a larger mechanized army, more and more reliance will have to be placed upon specialized intensive training programs to meet the shortages for technical and supervisory personnel.

**What About the Post-War Period?** All of us must be ready to make sacrifices and to endure inconveniences in order to assure victory in our present struggle to retain American idealism and our democratic form of government. At the same time we must not overlook post-war problems. Victory must be followed by an enduring peace. We must give our country our best talents in this war effort so that it is strong enough to meet the threats from our enemies against the American way of life. At the same time we must give, without delay, our best thoughts to a plan which will utilize the facilities we are now building up for our war effort to insure abundant life in a world at peace. The making of war can be turned to the service of peace, if the new techniques and facilities we are now developing are used to provide greater comforts and a higher standard of living for all the people of the world. Radio emerged from the first world war to become a great industry. It is conceivable that the techniques and skills which are being developed in this war will be utilized, even to a greater degree, to provide new industries of great national significance and which will have as their objectives greater service to humanity.

Planning for the post-war period is a challenge to our ingenuity. A practical plan must be developed for shifting to full-time peace employment the millions of people and billions of capital investment now needed for our war effort. As citizens we must not fail in our efforts to insure victory for the United Nations in the present crisis, but must at the same time aid in the development of a practical plan for the enhancement of American ideals and American standards in a world at peace.

**How Are We to Demonstrate the Superiority of a Free People?** Americans have achieved the highest standard of living in the entire world, not through depriving others of their human and property rights, but by reason of the very philosophy of our Government which encouraged the most creative people of the entire world to develop our natural and national resources. It is no accident that American creative genius is responsible for all the major inventions of the past century in the fields of agriculture, power generation and distribution, communication, transportation, and manufacturing. More abundant life was brought about in this country, not through banditry, but through industry, invention, use of science, war against vice and sadism, reverence for learning, justice, belief in liberty and equality, tolerance, and the other ideals which have characterized this, the most civilized and humane democratic nation in all history. It is up to us as patriotic American citizens to retain these ideals and to realize that our greatest assets in the present crisis are courage, industry, unity, and tolerance. Goebbels, the nazi Master Liar, refers to our land as "a country which has many social and racial tensions" and to "the inability and ineffectiveness of democratic nations to unify their efforts for the successful prosecution of a great war." It is our great responsibility, as citizens, to demonstrate our superiority as a free, courageous, tolerant, and united people, who have no individual or group differences at a time when the very ideals of our form of government are at stake. Let us pull together to insure a total victory for American idealism in its struggle against the ideology of the most unscrupulous and inhuman totalitarian racketeers of all times.

---

*Address presented before the Indiana Gas Association Convention at Indianapolis, May 11-12, 1942.*

**INSTANT GAS LEAK DETECTION**

**Designed so that a deficiency of oxygen will shorten or completely extinguish the flame of the Safety Lamp, the Davis Model 2 Combustible Gas Indicator offers maximum efficiency. It is not necessary to lower the safety lamp into the atmosphere. The sample of gas or vapor-air mixture is aspirated through the lamp after passing through the indicator. Approved by Associated Factory Mutual Fire Insurance Laboratories.**

**Send for Bulletin No. 1120 describing the Davis line of Combustible Gas Indicators.**

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**Davis Emergency Equipment Co. Inc. Chicago • New York • Houston**

**DAVIS PROTECTION**

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# OUR DUAL OBJECTIVE

**From Field to Market**

**MAIN LINE**
**BOOSTER**
**DISTRIBUTION**
**POWER GENERATION**

**HORIZONTAL DOUBLE-ACTING GAS ENGINE-COMPRESSORS**
for heavy duty main line service, in the larger capacities

**ANGLE GAS ENGINE-COMPRESSORS**
for main line, booster and distribution service, in medium capacities

**VERTICAL CONVERTIBLE GAS-DIESEL ENGINES**
for auxiliary station power service

**UNIBLOC GAS ENGINE-COMPRESSORS**
for limited space, for gas distribution service

**OPPOSED TYPE MOTOR-DRIVEN GAS BOOSTER COMPRESSORS**
design gives minimum shaking forces, for bad soil conditions

**DUPLEX SYNCHRONOUS MOTOR-DRIVEN COMPRESSORS**
for gas distribution service

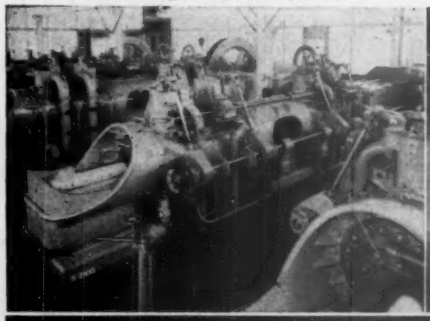
WORTHINGTON products are not built to serve for this period of emergency only, but to continue to operate for many years after industry returns to peace-time pursuits. Therefore there can be no letting down of the rigid standards that have been set for them as a basic Worthington principle.

It is our aim that Worthington equipment produced during this difficult period shall accomplish two purposes . . . first that it shall serve effectively and without interruption, on the many important jobs which it fills . . . and second that, in so doing, it shall make new friends, and retain the confidence of old friends.

To those plants where Worthington equipment is now in use, we offer the services of our district office engineers, and our headquarters staff, in checking conditions and performance, with a view to assuring continued operation at top efficiency.

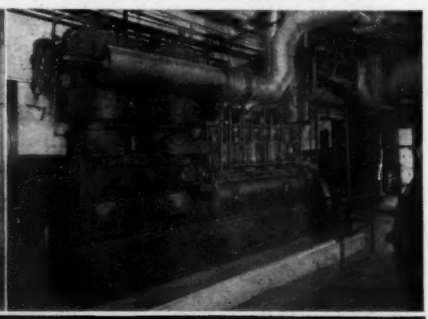
And in the planning for readjustment or expansion, whether for the war production program or the period to follow, the counsel of these specially qualified engineers is always available. M12-.8

*Horizontal gas engine compressors*



*An angle gas engine compressor unit*

*Unibloc gas engine with compressor*



WORTHINGTON

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# Customer Relations

## As Applied to Industrial and Commercial Sales

CUSTOMER RELATIONS is a subject, especially with industrial and commercial customers, that is being given much attention by gas company personnel. Oscar C. Warren, Industrial and Commercial Sales Manager, of the Birmingham Gas Co., Birmingham, Ala., presented a paper on the subject at the Natural Gas Convention, held at New Orleans, La., May 4-7th, in which he outlined the thorough way his company had gone into the matter.

Referring to some of their activities that are helping the war effort, Mr. Warren said:

"Close relation with the customer has proven to be the most valuable asset to any public utility in creating sound acceptance of their service. I shall attempt to give my views on how our efforts have and can best serve in the tremendously important task with which we are now faced.

"Many years ago our company outlined a program which has remained foremost in all of our activities—a cooperative plan with architects, consulting engineers and equipment manufacturers' representatives, etc., which offered our assistance in the engineering, selection and application of gas equipment in all fields of our service. Over a period of years this policy has gained their confidence in the ability of our personnel, and has brought them to realize that even though this service is without cost to them, it relieves them of a great responsibility, as well as expense.

"Our customer program has been to make their gas problems *our* problems. They having been educated to feel free to call on our engineers and special service men at any hour for assistance. Our services in the capacity of consulting engineers and for the adjustment of equipment, or for any call of an emergency nature are without cost to the customer. The services of our engineering staff in the training of one or more of their employees (designated by them) in the principles of combustion and proper operation and maintenance of controls and equipment has been at their disposal.

"As a result of these programs, we have been called upon for aid in the selection, and in some cases the designing, of gas burning equipment for use in the manufacture of essential war materials. We feel that by thus working with our customers and also with the equipment manufacturers' representatives, we are able to help the customer obtain the equipment best suited to his needs, thus aiding in his production efforts and also, through good fuel efficiencies, conserving our gas supply which is so vital to production in Birmingham.

"About two years ago our Management began forecasting the probable requirements for gas in our area on the basis of an all out war production schedule. This resulted in a large expansion program which included contracts for gas from additional sources, expanding facilities for increasing the supply of gas from existing sources, reinforcing and expanding main capacities, the installation of new pumping stations and additions to existing pumping stations.

"Only when the heads of our industries, and Ordnance and O. P. M. representatives were brought together by our Management, who laid before them our program with its many problems, did they fully realize the tremendous and important responsibility of their Gas Company in this program.

"Recognizing the inevitable loss of skilled men, due to entering our armed forces, retirement, and some to vital offense industries, we realized the necessity of turning to every mechanical device available which might serve in some measure to offset the personnel shortage plus the increase in demand for our services. One of the major devices and most valuable assets, particularly in the time of this war emergency, is our two-way radio communication system, which consists of one central transmitter station at our Service Department, one auxiliary transmitter at our Central Pumping Station, and twenty-five (25) two-way mobile units in our special emergency service cars.

"This system has proven to be of inestimable value to the entire Birmingham district, not only from the standpoint of our service, but is coordinated with and made a part of our Civilian Defense Communication System, having cross communication with our local Police Radio Systems, and the central nerve center of the Civilian Defense for our country.

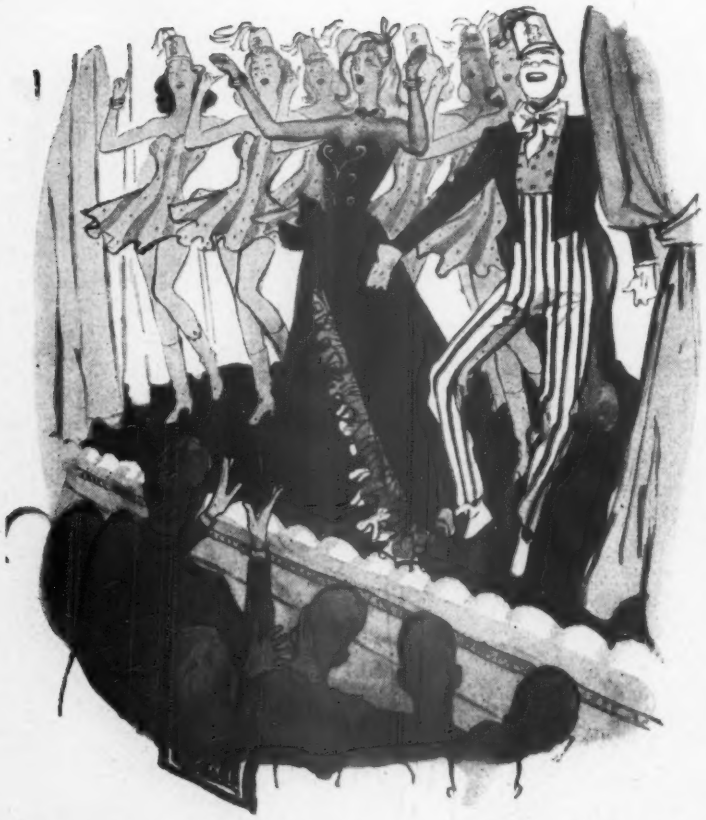
"We have organized within our Company, a Gas Utility Unit in connection with Civilian Defense which, though it is a self-contained unit, is part of the Civilian Defense Corps for Jefferson County. Our unit was organized on a voluntary basis.

"To date, one of the chief accomplishments of our Unit has been educational. Members of our organization have attended meetings of other units, such as Air Raid Wardens, Auxiliary Police and Auxiliary Firemen, and have given these other units information as to the correct procedure with respect to gas in case of an air raid or other emergency. This was made more difficult by the fact that considerable *incorrect* information had previously been given out from other sources. Similar educational work covering proper procedure and precautionary measures recommended for industrial gas users was accomplished through the Industrial Plant Co-Ordinator's School, and by direct mailing to all industrial plants in the area.

"As the output of our war industries increases, the demand for skilled labor and raw materials of all kinds increases, making it continually more difficult to obtain new or replacement items of plant equipment, or even repair parts for such equipment.

"Plant management, therefore, has an added selfish reason, aside from any patriotic reasons or duty for conserving its present equipment, even though this equipment is being used to its maximum capacity for production. This conservation can be best accomplished by proper maintenance, and "proper" maintenance requires frequent, periodic inspection and prompt repairing of any defects found.

"The periodic inspections of equipment should be made at definite intervals and by one or more qualified members of the plant maintenance personnel, definitely assigned to this



# What's a musical comedy got to do with winning a war?

**PLENTY!** We're building an army of men—not machines. And men have minds. And minds need freshening . . . change . . . relaxation.

So one of the biggest undertakings of the USO is its sponsoring of free entertainment, through the cooperation of the movie and theatrical industries, at army camps, naval bases—wherever the fighting men of the USA go to train or dig in.

USO Camp Shows, Inc. is actually the biggest single theatrical enterprise the world has ever seen. It books 264 shows for the boys every week, which play to an average nightly attendance of 50,000.

It contacts movie stars, theatrical headliners, big name bands and their leaders. It routes all these . . . plans their itinerary . . . arranges the most convenient times when soldiers and sailors can take time out to sit and be entertained.

For it realizes that the one great advantage of the American fighting man is his ability to think for himself, to make the most of any situation, to fight as a liberty-loving individual.

And this is one of his great differences from our enemy.

To help carry on the all-important work of maintaining the morale of our fighting forces, the USO needs your help . . . it needs your contribution.

Your dollar has many demands on it this year. Many of these demands must be met—others deserve to be met. And among these latter, the plea of the USO for whatever sum you can contribute merits your earnest consideration.

For we have a war to win, and the USO is directly concerned with the men who must—and will—win it.

Dig deep—for the men who are digging in!

Send your contribution to your local chairman or to USO, Empire State Building, New York.

**GIVE NOW TO THE USO**

***Above space contributed by Gas Purifying Materials Co., L. I. City, N. Y.***

work. Reports of needed repairs or adjustments made by operating personnel are quite important and should always be handled promptly. However, in addition to this, definite periodic inspection should be made of all gas burning equipment, preferably when the equipment is not in operation, in order to discover at the earliest possible moment the beginning of a failure or the existence of any condition which might cause damage if not corrected. For instance, the cracking or spalling of a furnace lining or burner tunnel might not be noticed by the operator as this condition would not affect the furnace operation in the early stages. This condition should be discovered in its early stages by the periodic inspection, and immediate repairs, if made, would cost very little and require little material. If allowed to go unrepaired for any length of time, the entire lining of the furnace might have to be replaced and considerable damage might be done to the furnace casing, burner equipment, etc. Repairs made in the early stages would normally cause very little loss in production time, whereas, major repairs usually cause considerable loss in production time.

"Our Engineers are making a survey of all industrial plants' equipment in view of recommending where practical that they install auxiliary equipment as insurance against possible interruptions in gas supply, also realizing that in many cases other types of fuel such as oil, coal and coke can be used to release gas for those operations where gas is more essential in the production of war materials. Also, in our surveys, consideration is given to all operations that might be shifted from day time (which is our peak) to night time operation, thus materially relieving demands on our storage cushion. In view of the inconvenience and additional expense to the customer, such survey and favorable results can only be made where close relations and a mutual confidence exists between customer and company."

**In another paper presented at the same meeting, Karl Emmerling, of The East Ohio Gas Co., Cleveland, O., discussed the subject of industrial and commercial gas equipment. "There has never been a time" said Mr. Emmerling, "when it has been more necessary to maintain industrial gas equipment at its most efficient operating level."**

"It therefore behooves every user of industrial heating equipment to treat it with the best of care, and to maintain it at its highest operating level. It seems to me that it is part

of the duty of every industrial gas engineer to see to it that the users of industrial gas in his district receive proper instruction as to how to best operate and maintain their gas equipment. Here are a few of the precautions that can be taken to increase the life of an industrial gas furnace:

1. **Heat furnaces up slowly.**
2. **Cool furnaces down slowly.**
   **There is nothing that will ruin brickwork faster than fast heating up or cooling down. Plenty of time should be allowed for both of these operations.**
3. **Patch cracks in brickwork as they are noticed.**
   **Small cracks that are patched in time may save a major brick laying job a week later.**
4. **Prevent, as far as possible, flame impingement on metal parts of the furnace, such as door frames, buck staves, etc. Warpage and buckling of metal parts impart undue strain on the brickwork, which sometimes results in the collapse of part or all of it.**
5. **Do not overload conveyors.**
   **One of the commonest reasons for delay is broken conveyors, and overloading is what generally causes the break.**
6. **Do not overheat furnaces, particularly those equipped with heat resisting alloy parts.**
   **Furnaces are usually designed for certain temperatures, and gross overheating may damage the linings. The same is true of alloys used, and heat resisting alloys are becoming difficult to obtain; therefore, care in their use is vital.**
7. **Keep all control equipment properly oiled, adjusted, and scrupulously clean.**
   **This equipment is delicate and gets out of order easily. In these days of exacting heating requirements, an inaccurate pyrometer may pile up rejections rapidly.**
8. **Be careful in lighting up.**
   **Explosions due to delayed ignition do the brickwork no good.**

"Now is the time when it may be possible for the industrial gas man to have some of these wasteful practices stopped; not so much for the saving in money that will result to the customer, but because more continuous service to war industry may be possible next winter by reason of such saving, and because it is patriotic to use gas wisely.

"Conservation does not always require the expenditure of large sums of money. It is often accomplished by proper training of operators, application of insulating materials, use of automatic controls, minor changes in furnace construction, and in various other ways. Here again the industrial gas engineer can be of real help; he knows more about methods of reducing gas consumptions than most of his customers, and it is part of his job not only to tell his customers about such methods but also to sell the idea of getting them adopted.

"When we get back to a normal existence, competition will come back, and come back fast. Tremendous manufacturing capacity will be freed for peacetime purposes; the electric utilities will have a large amount of surplus generating capacity; fuel oil will be available in large quantities; stoker and oil burner manufacturers will get back into the field; and on top of that, undoubtedly improvements in the utilization of electricity and fuels will come out of this war effort, that may change the entire fuel utilization picture.

"Only if our customers remain our friends will we be able to meet this inevitable tide of competition with a half-way chance of overcoming it. If our customers, due to neglect on our part, can be persuaded to go to another source of heat, without even giving us a chance to tell our story, then, gentlemen, we will be lost.

"The gas salesman will be spending most of his time telling his customers that he cannot get new gas equipment or an increased gas supply; what with the Natural Gas Limitation Order, overloaded lines, and cold weather, gas companies are going to be called upon by the industrial and commercial customers for service and equipment that they cannot possibly supply.

"He is going to have to say 'No' ten times for every time that he says 'Yes,' and he will have to learn to say 'No' in such a fashion that the customer likes it. Not an easy job. It will require a world of tact, patience, and a very sympathetic and helpful attitude on the part of the salesman.

"The main thing is that we should continue to contact our industrial and commercial customers ,and find ways of being helpful to them, so that they remain our friends and will look to us for help and advice when the war is over and the switch from war to peace time production starts."

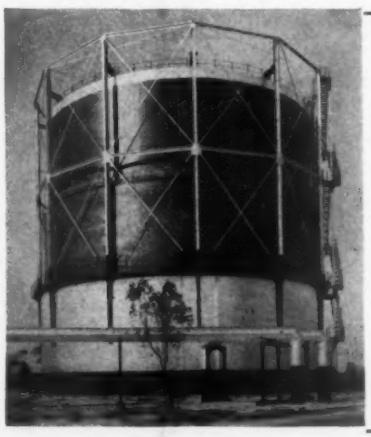
## Canadian Petroleum

Canadian petroleum operators have been placed on substantially the same footing as United States operators as far as priority assistance is concerned, the Director of Industry Operations announced in June. Action was taken through Amendment No. 1 to Preference Rating Order P-98, extending the provisions of P-98 to the Canadians.

Under P-98 preference ratings from A-1-a to A-10 were assigned for deliveries of materials to be used for specified purposes in the production, refining, transportation and marketing of petroleum and petroleum products. Ratings also have been given for the production of natural gas.

Canadian operators wishing to use the ratings assigned by P-98 must apply for a copy of the order to be issued to them individually with a serial number.

The filing of reports and communications and the obtaining of countersignatures by Canadian operators will be handled through the Office of Oil Controller, Dominion of Canada, rather than through a District Office of the Office of Petroleum Coordinator.

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# New Rule For Efficiency Of Gas Fired Boilers

By

**W. F. Schaphorst, M.E.**

Newark, N. J.

As every gas engineer doubtless knows, to measure boiler efficiency we are usually told to "find the heat in the steam evaporated by the boiler and divide it by the heat given up by the fuel." In other words, boiler efficiency, like all other efficiencies, is equal to OUTPUT divided by INPUT.

That being the case, why bother about steam at all if we know the quantity of heat that escapes up the chimney? Isn't it logical to conclude that the heat that "doesn't" escape up the chimney is absorbed by the boiler? To determine the output, then, simply subtract the heat lost up the chimney from the original heat in the fuel. On that basis of reasoning we get this formula:

$$\frac{\text{(Heat in fuel)—(Heat lost up chimney)}}{\text{(Heat in fuel)}} = \text{Boiler efficiency.}$$

Obviously, with ideal combustion of fuel, and with a boiler that is perfectly insulated so that all waste heat would be confined to the chimney, the above formula would give very accurate results. But of course combustion is not always ideal, and regardless of the thickness of insulation *some* heat is bound to pass through the boiler walls.

Consequently, rather than be guided entirely by theory, this writer studied the averages of a number of authoritative tests where the boiler efficiencies varied from a trifle over 60 per cent to nearly 80 per cent. The heat value of the fuel was known and considered in each case, together with the temperature of the chimney or exit gases. As a result the following rule has been developed for gas fired boilers:

**"Multiply the chimney gas temperature in deg. F. by 35.5 and divide by the heat value of the gas in B.t.u. per cu. ft. Subtract the result from 100. The remainder is the approximate boiler efficiency in per cent."**

Anticipating that some readers may ask, "Where does the 35.5 come from?" I believe that will be understood by throwing the above rule into the form of the first formula given here, namely,

$$\frac{H-h}{H} = 1 - \frac{h}{H} = \text{Boiler efficiency.}$$

where H = heat in the fuel;
h = heat in the chimney gas.

Multiplying both sides of the above by 100 to express efficiency in per cent it becomes

$$100 - \frac{h \times 100}{H} = \text{Efficiency, per cent.}$$

In my calculations I found that 35.5 multiplied by the chimney gas temperature approximated closely the heat in the chimney gas multiplied by 100. And that is where the 35.5 came from. In other words, the 35.5 is an empirical constant based entirely on experimentation.

The above boilers, by the way, were fired by natural gas having a heat value varying from 980 to 1040 B.t.u. per cu. ft. In the event, therefore, that your heat values are considerably different the writer would advise caution.

INDUSTRIAL GAS BOILERS
GARMENT PRESS BOILERS
100 lbs. ASME Code
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MAIN OFFICE
CEDAR RAPIDS, IOWA

For example, in one of the above tests the figures gave the maximum chimney gas temperature as 625 deg. F., at which point the boiler efficiency according to actual test was 78.3 per cent. The above new rule gives its efficiency as 77.8 per cent, or, one-half of one per cent "off." The minimum temperature of the chimney gases during the same test was 443 deg. F., at which point the boiler efficiency according to actual test was 84 per cent. The above new rule gives its efficiency as 84.3 per cent, which most engineers would regard as being "pretty good."

The writer wishes to emphasize that the above rule is based on good boiler operation. For instance it is possible to obtain a "fake" result by using so much excess air in combustion, or by admitting so much air into the chimney, that your exit gas temperature will be low, in which event the rule will say that your boiler efficiency is high. Therefore to be sure that the amount of air supplied to the boiler is correct it is advisable to use a $CO_2$ indicating outfit of one kind or another. Excellent $CO_2$ indicating and recording devices are now being made and at prices ranging all the way from a few dollars to several hundred dollars, so that every gas burning plant can now easily afford to have one. It is exceedingly important that the percentage of $CO_2$ be right. Then apply the rule.

In other words the only special instrument that is most likely to be necessary or desirable for making the above simple experiment, or efficiency test, is a $CO_2$ outfit. Most plants are equipped with thermometers capable of taking chimney gas temperatures. If you have these two instruments you are "all set" for the test.

## Give Due Credit

The surest way to stimulate thinking among your men is to give them credit for the results of their thinking. The surest way to kill better job method suggestions is to steal the credit for his suggestion from one of your men. You need steal credit only once to set up a barrier which will prevent you from ever getting any other ideas from your men. Nothing travels faster than the news that the "boss stole my idea." At the same time nothing is more of an inspiration to a man than to be given credit for a good idea. Give credit where credit is due and you will stimulate a whole flood of better job method suggestions.

**Just a little something you turned out the other day**

Ever take a trip through a shipyard . . . and watch great jets of flame fan over plates of solid steel in heat treating furnaces? Ever look into the inferno of an annealing furnace . . . or see a slab of steel brought up to proper forging heat?

You are supplying the fuel for these essential operations. *Yours* is part of the job of speeding into active service the craft that carry the arms that will carry us to Victory.

And, *yours* is the credit for the competent efficient way you're handling this, and every other part of your wartime job!

We know well the magnitude and excellence of that performance, industry-wide—for, we are privileged to work with many of the leading gas companies, simplifying purification problems, saving them time, labor and material.

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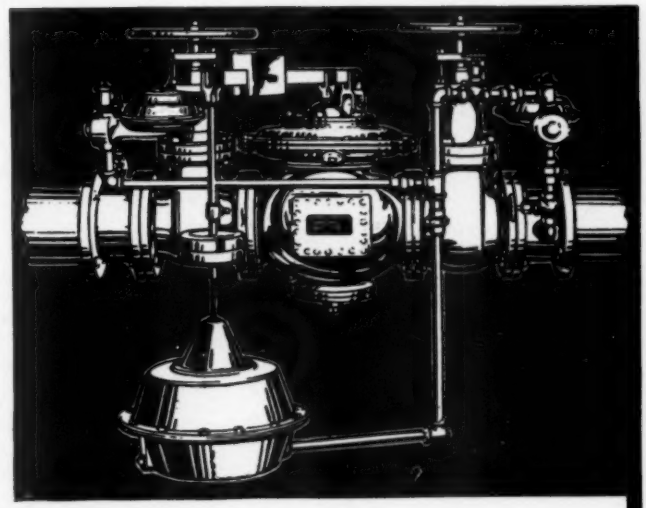

REYNOLDS Build District Station Regulator in Single and Double District Types. Reynolds also offer a KT Series having internal toggle levers which construction does not require an Auxiliary Bowl. Both types of Regulators give satisfactory performance throughout a wide range of operating conditions. They are adaptable to use with special combinations of equipment where conditions require closer control.

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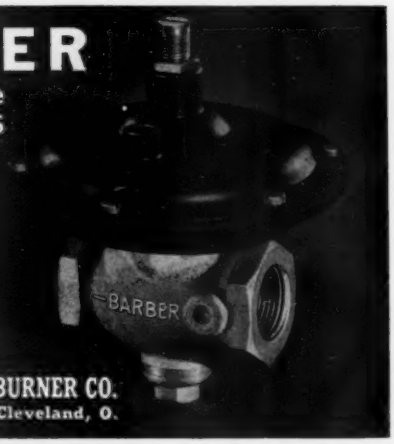


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# War Production Board

## Bureau of Industrial Conservation

### Scrap Metal Salvage Program

A NEW and greatly intensified nation-wide salvage program, designed to reach into every home and industrial plant and increase the flow of all vital scrap materials to the country's war plants was announced July 13th by Donald M. Nelson, chairman of the War Production Board, and Lessing J. Rosenwald, chief of the Bureau of Industrial Conservation.

The overall campaign started formally on Monday, July 13, immediately after the completion of the current scrap rubber campaign which has been extended to July 10.

"The immensity of the task we face," said Mr. Nelson, "makes it absolutely necessary to step up the tempo of our national salvage program. Our war production is limited only by the supply of raw materials, and scrap is an important part of the raw materials supply. This makes it clear that the only way we can meet the requirements of war production is to collect every last bit of scrap from every farm and home, and from every commercial enterprise and industry in the country."

Beginning July 13th, the 12,000 state and local salvage committees already in existence will have new forces at work to help them, provided by private industry working in cooperation with the Bureau of Industrial Conservation.

One of these forces is a national advertising program, sponsored by private industry and aimed at telling the public the facts about what we need, why we need it and what each person can do to help.

Another new force is the joint assistance of the farm implement industry, which has been offered for the movement of farm scrap in a "National Scrap Harvest."

Through these various arrangements salvage committees will be able to step up their all-out continuing effort.

While the Bureau of Industrial Conservation considers the new campaign as an integrated whole, it has the following clearly defined parts:

1. An intensified campaign to collect metals, especially iron and steel, and rubber and other waste materials which will flow through regular channels of trade.

2. A waste fats campaign, in which housewives will be urged to sell their waste kitchen fats, such as bacon dripping, to meat dealers who will send them back through the normal channels of trade. Waste fats are needed to stimulate production of glycerine, which in turn is needed for war and industrial explosives.

3. A tin can collection campaign which is to be carried out *only in selected localities*, and then only when local anouncements are made.

In support of the overall effort, which is known as the National Salvage Program, the iron and steel industry has already raised approximately $1,500,000 to pay for national advertising which will be run in daily and weekly newspapers, general and farm magazines, and trade journals, and also for radio time. It is expected that this fund may be increased. The advertisements sponsored by the industry will be designed to stimulate all scrap collection, including metals other than iron and steel, and also rubber and other materials.

The glycerine producers and associated industries have raised a fund of approximately $500,000 to pay for additional advertising directed especially toward waste fats collection.

These industry advertising campaigns will be closely integrated with the program of the Bureau of Industrial Conservation and will take advantage of the fact that the summer is the best time of year to build up stockpiles of waste material.

Officials of the Bureau made it clear that all organizations which have taken a part in the program to date would continue to be used: The volunteer workers of local defense councils, the various charities who have collected waste materials, and the youth organizations which have already done an outstanding service to the Nation in the collection of scrap and waste materials. For example, the Boy Scouts have already announced a national "Treasure Hunt" for scrap which aims to "build a bridge between the homes of this country and the yards where materials are sorted, graded, processed, packed and shipped."

## W. P. B. Frees Frozen Inventories

### Priorities Regulation 13

A regulation releasing huge quantities of critical materials now tied up in idle inventories was issued July 7th by the War Production Board.

The new order—Priorities Regulation No. 13 — is expected to free "hundreds of thousands of tons" of materials needed by vital war industries, and to affect thousands of companies which have been unable either to use or to dispose of their material stocks due to existing limitation orders.

Object of the regulation, it was explained, is to set up new and uniform rules governing the sale of idle inventories of certain kinds, and to remove such transactions from existing regulations which have heretofore blocked the free flow of the material in commercial channels.

It was admitted that limitation orders, issued by W. P. B. in anticipation of industrial conversion to war production, and to conserve scarce materials, have had the effect of withholding from war industries some of the materials they need.

In the case of copper and copper base alloys alone, it was today estimated that 250,000 tons have been frozen in idle inventories. Under the new regulation it is believed that this amount will be freed.

Under the older regulations the restrictions themselves were somewhat complex. Sometimes certain permitted types of sale were listed in the original order. In other cases no sale might be made without application to Washington and without specific authorization from the Director of Industry Operations.

Such restrictions are now replaced by the new and somewhat simplified regulation which controls all sales of restricted material, including those sold in liquidation and bankruptcy proceedings.

The case of a domestic refrigerator manufacturer who had on hand a large stock of copper tubing frozen tight by restrictions on refrigerator production has been cited as an example of the new simplified procedure. His copper tubing was urgently needed by a company in the same city which was turning out tank assemblies. The refrigerator manu-

facturer could not use it himself, but under Limitation Order L-5-o he could not sell it either without seeking, and then waiting for official approval.

## Regulation 13 Explained

Under regulation 13 he will be able to make such a sale without even reporting it, much less having to get down to the protracted formalities of an application to Washington.

W. P. B. officials have clarified this further by pointing out that these specially authorized sales are "upstream" sales to distributors or manufacturers, or sales by manufacturing users to producers of raw materials. This, it was said, serves to restore them to normal distribution channels. Applications for specific sales not covered by the provisions of regulation No. 13 should be filed on form PD-470 at the nearest W. P. B. field office.

Under the new regulation, sales of less than $100 may be made to anyone.

Those materials not included under schedule "A" may, it was said, be purchased by anyone authorized by existing regulations to receive and make specified use of them. It is pointed out in the new regulation, however, that its terms do not exempt a purchaser from end-use and quota restrictions.

## Condition on Sales

Schedule "A" also sets forth the various conditions under which metals, chemicals, alloys and other restricted commodities may be sold, and to whom.

Copper, brass mill and foundry products may be sold, for example, without preference ratings to purchasers who produce material in the form in which it was acquired by the holder; and to producers permitted to buy for an authorized use, on orders bearing a preference rating of A-1-k or higher. They may be sold without preference ratings to a wholesale dealer in the material in the form held by the seller, if the dealer has been issued an allocation certificate or any other authority to buy.

They may not be sold to scrap dealers.

One point strongly emphasized was that any purchaser acquiring war materials as a result of a type of sale authorized by regulation No. 13 must comply with all inventory, quota, and use restrictions imposed by all other orders and regulations.

Under the new ruling, the inventory and requisitioning branch of W. P. B. will aid the flow of idle materials and production equipment into war industries, and all queries should be addressed to its representative in the nearest W. P. B. field office.

## Utility Company May Sell Excess Stocks on A-5 or Higher

A utility company may sell materials from excess stocks or inventories to any other utility company of war production plants, provided the order for such materials carries a preference rating of A-5 or higher. This is provided for in Amendment No. 2 to P-46, announced July 9.

## Tin and Terne Plate Ruling Modified

Tin and terne plate which had been put in process on May 16, 1942, and roofings, furnace pipe, and fittings in inventory on May 16, 1942 may be used for repairs, regardless of ratings, and on defense housing under an amended version of Supplementary Order M-21-e, issued July 11th. The amended order also adds certain items to the list which may use tin or terne plate, and relieves warehouses of the necessity for reporting to W. P. B. on Army and Navy orders, but does require the warehouse to obtain a certification from its customer on these orders.

Schedule A of the original order, listing products which may use tin and terne plate, is extended by the addition of certain kinds of dairy ware, textile spools and bobbins, gasoline tanks, radiators for internal combustion engines, chaplets, skimgates, and tin forms for foundry use, torpedoes for oil and gas well shooting, and carbide non-explosive emergency lights. Each of these new permitted uses is restricted as to type of plate, and amounts of tin and terne that may be used in each item.

The original order M-21-e specifically limited the amount of tin and terne which might be used, and directed the purpose for which it could be used. The net effect of this amended order is to unfreeze certain inventories and to permit additional uses of tin and terne plate.

| | | |
|---|---|---|
| | Hot Dipped Tin Plate | 3.30 lbs. per base box (2a Charcoal). |
| Gas meters | Electrolytic Tin Plate | 0.50 lbs. per base box. |
| | Short Ternes | 1.30 lbs. per base box. |
| | Long Ternes | 4 lbs. per base box. |


# THE M-SCOPE PIPE FINDER

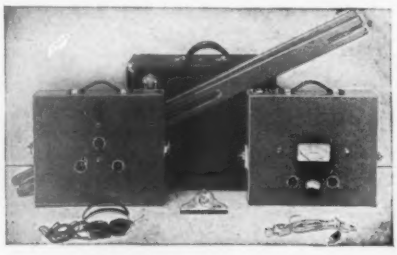
Gives Accurate and Speedy Location of Mains, Dead Ends, Valves, Manholes and Drip Boxes. Gives both direction and depth.

Eliminates Exploratory Excavations.

Locates illegal or unauthorized connections.

Avoids accidental damage to other unknown lines in the path of trench diggers.

Checks existing records and surveys unmapped territory.



The M-Scope consists of two specially designed radio units: A transmitter and a receiver. In operation, the transmitter sends out a continuous signal, and when there is no metal interposed between the two units, a definite volume of sound is heard in the earphones of the receiver. A meter mounted on the receiver gives a definite reading. If a metal object lies between the two units, the sound heard in the earphones will be louder and meter reading higher.

Complete M-Scope equipment includes transmitter, receiver, earphones, spirit level, and conductive wire with clips along with carrying case.

*Hundreds of Gas Companies and other utilities now use the M-Scope. Complete details with illustrations in Bulletin 6. Send for it.*

**Joseph G. Pollard Co. Inc.**

*Pipe Line Equipment*

152 Ashland Place Brooklyn, N. Y.

## Coal-tar Xylol Brought Under Preference Order

Xylol and xylol range aromatic materials derived from coal tar were brought under control of General Preference Order M-150 by Amendment No. 1, issued July 11. The order, restricting sale and delivery of xylol and xylol aromatic materials to orders bearing preference ratings of A-2 or higher, originally defined these products as " . . . of petroleum origin." A substantial amount of xylol and xylol aromatic materials are being produced as a byproduct of toluol manufacture, and are, therefore, coal tar derivatives. As such, they were not covered by M-150.

## Amendment of Order P-46

Preference Rating Order P-46, as amended, was further amended July 23rd, in Supplementary Preference Rating Order P-46-a, to permit utility companies to make extensions to facilities for the Army, Navy or Maritime Commission upon direct order by them.

However, it was provided that the total length of such gas or water main extension or the electric service line may not exceed 250 feet and the total cost of material required for the extension may not exceed $1500 in the case of underground construction or $500 in the case of other jobs.

The purpose of the amendment is to enable the Army, Navy or Maritime Commission to obtain extensions of electric, gas or water service to barracks or other temporary buildings without prior approval of WPB. The order previously required WPB approval of any extension, regardless of the length or the cost of such extension.

## Stove Metals Put On Quarterly Basis

The limited number of manufacturers permitted to produce domestic cooking appliances and heating stoves after July 31 may figure their allowed consumption of iron and steel, subsequent to June 30, on a quarterly, rather than a monthly, basis. Amendment No. 2 to Limitation Order L-23-c makes this change.

Permitted consumption of iron and steel during any calendar quarter is three times 70 percent of a manufacturer's average monthly use for cooking appliances during the base period, and three times 50 percent of the average amount which went monthly into heating stoves, during the same time.

# War Manpower Commission

## War Plants Rapidly Absorbing Available Labor Supply, McNutt Declares

War plants are rapidly drying up the available supply of labor, Chairman Paul V. McNutt of the War Manpower Commission said July 13.

Approximately 12,500,000 persons were working on July 1 in direct war employment, including war plants and transportation, power production and governmental employment directly connected with the war, he announced.

War employment has practically doubled in the 7 months since Pearl Harbor.

General labor shortages are apparent in many war industry centers and will spread rapidly in the next few months," Mr. McNutt said. Increased employment of women and other persons not now in the labor force will be necessary to meet the demands for war workers during the next year and a half.

The estimates were made for the War Manpower Commission by technicians of the Bureau of Labor Statistics in the Labor Department and the Bureau of Employment Security in the Social Security Board. "War employment" includes all manufacturing on war contracts, Lend-Lease and foreign purchases, and a percentage of transportation and public utilities, including some governmental employment, which is directly chargeable to the war. The estimates cover employment at all stages of production, including mining, raw material processing and transportation, as well as final assembly.

## Gas for Cooking and Water Heating

Federal Public Housing Authority Release IS-104, July 15, lists the areas in which War Production Board Limitation Order L-31 of February 16 and amendment of April 23, curtailed the use of natural or mixed gas for space heating. The Release says:

"There is no objection to the use of *gas for water heating and cooking.* For these purposes, the question of gas supply will depend upon the existence of gas mains in the street, or the proximity of the existing gas distribution system and the amount of critical materials required in connecting the new houses. However, the WPB does not classify master metered housing projects as domestic consumers under this order. For this reason, it is necessary that an exception be obtained if the usage in the project will amount to more than 10,000 cubic feet per day.

"Electric power should not be used in any area for space heating or water heating purposes. Electric energy should not be used for cooking unless there is no other practical solution, that is, gas, oil, or coal should be substituted wherever practical to do so."

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### Consumers Power Co. of Michigan

The Michigan Public Service Commission has approved petitions of the Consumers Power Company revising its Standard Rules and Regulations in the following respects:

1. To include the provision that the company shall not be held liable for "loss or damage occurred under or by virtue of the exercise of authority or regulation by governmental, military or lawfully established civilian agencies or due to conditions or causes beyond the company's control."

2. To read its meters once in two months but to render bills monthly. Bills for the month in which meters are not read will be assumed to be one-half of the previous two months. Bills for the months in which meters are read are to be adjusted. Space heating customers are to be billed on a bi-monthly basis with the billing for the month in which meters are not read calculated on the basis of degree days. Bi-monthly billing will not apply to industrial customers and to certain other classes of customers where frequent readings are deemed necessary or advisable. The information shown on the bills will consist of a closing date of a period for which the bill is rendered, the net and gross amounts payable, the due date, statement that any tax which the utility is authorized to collect from its customer is included in the amount bill, together with the name and address of the customer.

3. A re-statement of the rule which provides that the company will install at its expense a maximum of 100 feet of service pipe on the customers premises for a customer to provide a limit of $50.00 on the cost of such construction. Where relocation of a service connection is required by the customer the cost of all such changes made necessary shall be borne by the customer. Unusual cost incurred in furnishing service to a commercial or individual customer is to be borne by the customer.

# Office of Price Administration

Steps to save rubber now being wasted by ignorance of tire care and by deliberate abuse and neglect are being taken by the Office of Price Administration.

Inspectors who examine tires as a part of the procedure followed by applicants for rationing certificates have been given a set of instructions to help them in determining when a tire is repairable and recappable and when it has been neglected or abused.

This action is intended to give force to a provision in the tire rationing regulations that permits local War Price and Rationing Boards to refuse tires to any who have abused those they already have or who have driven them beyond the point where recapping is practical.

Spot checks by tire experts have shown that overloading, underinflating, bad braking or poor wheel alignment has made scrap rubber of many a tire that, except for these abuses, could have been rescued for further useful life by application of only a fraction of its weight in recapping material.

It is this waste that OPA wants to stop. The tire failures resulting from such abuses are the kind the inspectors have been told to be on the look-out for.

Local boards, in their discretion, may refuse to grant certificates to applicants when the inspector's report shows:

1. The tires to be replaced have been run beyond the point where they can be repaired or recapped. (Specifications have been drafted to determine what that point is.)
2. Tread plies have become separated due to overloading, neglect in keeping tires properly inflated, or operation at high speeds.
3. The casing has been damaged by running flat.
4. Dual tires have been improperly matched.
5. Wheels are out of alignment.
6. The tire has been damaged by uneven braking.
7. Spotty wear indicating that the tire has been run on a bent rim.

It is recognized that the above standards are not absolute and that there may be mitigating circumstances. When tires have been damaged by faulty wheel alignment, for instance, or by uneven braking or mounting on a bent rim, the local board may withhold action under the abuse standards if the operator of the vehicle on which the tires are mounted can show that he has corrected the condition or has taken steps to get it corrected.

Specific directions as to when a tire should be removed for recapping have been put into the hands of the tire inspectors by the OPA. The most economical point for recapping either a passenger car or truck tire, according to the OPA instructions, is when the casing is worn smooth approximately three-fourths of the total width of the tread and not beyond the point where there still remains an eighth of an inch of tread rubber above the "breaker strip," or outside ply of cord. However, tires showing considerably more wear than this, and even those that have minor carcass damage, are considered economically recappable, although not so serviceable as those that are removed in time.

A damaged tire is recappable, according to OPA instructions to inspectors, when it does not require more than two sectional repairs of breaks or cuts. When the lesions are more than three inches long, however, or are below the point where the sidewall of the tire contacts the top of the rim flange, the casing cannot be recapped satisfactorily. This applies to truck as well as to passenger car tires.

Truck tires, because of their heavier fabric construction, may be worn somewhat farther than passenger car casings and still be fit for recapping. The ultimate wear for a passenger car tire is through one body ply of cord fabric, while truck tires that are worn through two plies may be recapped.

Besides wear beyond the ultimate points designated, and cuts and breaks more extensive than those described as repairable in the instructions, there are four other kinds of damage that make tires unfit for recapping: (1) Ply separation; (2) broken or exposed bead wires; (3) failure at the bead reenforcement; (4) separation of cord in inside ply.

Inspectors are required to report cases of abuse to the local board.

Denial of tires on evidence of abuse is not mandatory. The regulations give a certain amount of latitude to the local boards, which can weigh the matter with regard to the loss which the community might suffer if the applicant were not able to get tires. "Where the community would suffer no serious loss if the applicant were denied tires," the regulation says, "because other persons can provide the same service, or for other reasons, the Board may refuse to grant tires".


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# RECENT COURT DECISIONS
## Affecting Gas Utilities

# Legal Duty to Supply Gas

By
**Leo T. Parker**
Attorney at Law
Cincinnati, O.

IT IS WELL KNOWN that, under ordinary circumstances, a gas company may cut off gas supply for failure of a consumer to abide by reasonable rules and regulations. For example, various higher courts have held that gas companies have a right to adopt and enforce reasonable rules and regulations for their security and convenience and enforce compliance therewith by refusing or discontinuing the service. However, such rules must be reasonable, just, lawful and not discriminatory.

Moreover, either a municipality or gas corporation furnishing gas may, by ordinance or by-laws, make reasonable rules and regulations to insure the payments of bills, and among others, that of stopping the supply unless all arrearages are paid, whether owing by the tenant in possession or his predecessors. But further, a recent higher court held void a state law that a gas company is prohibited from cutting off the supply of gas until the amount of the deposit has been used up by the charges for gas supplied. See Hewsey v. Queens Borough Gas & Electric Company, 93 N.Y.S. 114.

Notwithstanding these well known propositions of law the legal effect of a new rule, known as the humanitarian rule, recently has disturbed certain gas company officials as to when and under what circumstance the company may be held liable for cutting off gas supply although the consumer actually failed to abide by lawful and reasonable rules and regulations.

### When Liability Exists

In this article we shall review late and leading higher court cases which establish the law that unless a relation exists between the sick, helpless, or injured and those who witness their distress, of a nature to require and impose upon them the duty of providing the necessary relief, there is neither legal obligation to minister on the one hand, nor cause for legal complaint on the other. Obviously, however, if the gas company owes to any one a certain and well defined legal duty, a failure to fulfill this duty may result in liability. Otherwise, no humanitarian rule is applicable.

For illustration, in Oklahoma Gas Company v. Young, 116 Fed. 720, reported January, 1941, it was disclosed that a woman named Young sued a gas company to recover heavy damages on the contention that on December 28 the company with knowledge that she was sick and confined to her bed under the care of a doctor and nurse turned the gas off during cold weather with the result that she suffered considerably and contracted pneumonia as a final result of the wrongful turning off of the gas.

During the trial the counsel for the gas company admitted that the company was furnishing gas at the address where Mrs. Young lived and that it cut the gas off on the day in question because of the delinquency in the payment of the account. Further testimony was given which proved that the original application for gas was not made by Mrs. Young and that her name was in no wise connected with the contract to furnish gas but that the gas was being furnished under a contract with a person named Lamb and that the account had been repeatedly delinquent. On December 1 the bill being delinquent, by special contract, service was continued until the 22nd, on which date the bill not having been paid, the gas was cut off. Service was restored on an oral guarantee that the bill would be paid by the 24th. The bill was not so paid and service was discontinued on the 28th on which date Mrs. Young contended that her health had been impaired.

The lower court considered all and decided that on December 28 Mrs. Young was confined to her bed by reason of injuries previously received in an automobile accident and was then under the care of a practical nurse; that the gas company was serving the house where Mrs. Young was living and was advised by her nurse of her condition, and through its agents and servants knew that to turn the gas off—which was the only means Mrs. Young had for heat or warmth in the house—would cause her (plaintiff) serious harm, the weather at the time being damp and cold; that the act of the gas company through its agents and servants in cutting off the gas was within the course of their employment and directly and proximately caused Mrs. Young to suffer sickness and pain and resulted in a serious and permanent bronchial condition, precipitated and directly brought about by cutting off the gas supply to the house.

The lower court held further that as a matter of law the company was guilty of abuse of any right it may have had to discontinue gas service to the house in which she lived and that it was liable in heavy damages to Mrs. Young.

In other words, the lower court decided that the gas company had a legal right to cut off the gas supply, yet it was an inhuman act to refuse heat to a sick person whereby the company should be held liable for the resultant damages.

The counsel for the gas company appealed to the higher court and proved that on December 1, $11.50 was past due and delinquent. The meter had been read on November 13 for that bill, then from November 13 to December 13 there was an additional amount of gas consumed of $12.39, and from December 13 to the 28th, to the date service was discontinued, an additional amount of $5.97, or a total amount served up to the time the gas was shut off of $29.86, which left a considerable deficiency even after the $15 deposit was applied against this debt.

It is important to know that the higher court reversed the lower court and in holding the gas company not liable, said:

**"A gas company may, in the discharge of its duties to the consumer, govern its action by reasonable rules and regulations, . . . . . This is an inherent power implied from the nature of the business, limited only by the charter or by express statute or ordinance. The general rule is that a public service company furnishing gas may require the charges to be paid for a reasonable time in advance or be secured by a reasonable deposit by the consumer. And may enforce such a requirement by the refusal of service to persons who do not comply. It follows as a matter of law the plaintiff, not having complied with the reasonable and legal demand of the appellant for the payment of the overdue account at the time the gas was turned off, was in no position to demand that service be continued. The penalties for withholding relief from the suffering or for failure to respond to the call of worthy charity are not to be found in the laws of men, but only in that higher law, the violation of which is condemned by the voice of conscience."**

## When Duty Exists

Nevertheless, circumstances may exist under which any person, firm or corporation may by natural conditions owe a duty of such character that failure to perform it, on the humanitarian rule basis, may result in liability. The leading higher court case is Depue v. Flateau, 111 N.W. 1. In this case it was shown that a cattle buyer went to the farm of a gas consumer on a cold winter evening to buy cattle. On account of the darkness, he was unable to inspect the cattle until daylight. He asked to remain, which was refused. He was then taken violently ill, and again asked permission to remain, which was refused. He was helped into his cutter, but on his way home again became ill and lost consciousness, and because of exposure suffered impairment of health and other injuries.

The cattle buyer sued the farm owner to recover damages. It is important to know that the higher court decided that the cattle buyer was not a trespasser and therefore the farm owner owed him the duty, upon discovering his physical condition, to exercise reasonable care in his conduct not to expose him to danger by sending him away from his house. The court held the farm owner liable in damages.

On the other hand, see leading case of Union Pacific Ry. Company v. Cappier, 66 Kan. 649, involving the humanitarian rule of law, in which the court said:

**"Those duties which are dictated merely by good morals or by humane considerations are not within the domain of the law. Feelings of kindness and sympathy may move the Good Samaritan to minister to the sick and wounded at the roadside, but the law imposes no such obligation; and suffering humanity has no legal complaint against those who pass by on the other side."**

## Company Held Liable

As above explained failure of gas company officials or employees to perform a contract or other obligation may result in liability.

For instance, in Coy v. Indianapolis Gas Company, 146 Ind. 655, a natural gas company was held liable for failure to supply the needed fuel in severe winter weather to a dwelling house which it was under a duty to, and had, contracted to supply gas, and for which other fuel could not be procured. The Indiana State Supreme Court held that the refusal of the gas company *to discharge its duty* to the property owner directly contributed to the sickness and death of his children, and recovery was allowed. The decision was based upon the general duty of public utilities to supply their services to consumers, and there was no allegation of any failure on the part of the customer to carry out his part of the contract.

Also, see Fort Smith Gas Company v. Cloud, 8 Cir. 75 F. 2nd 413, where a husband rented a house and made a contract with a gas company for natural gas for heating and made the required deposit. In reliance upon the gas company official's statement that gas would be immediately turned on, he moved his family into the house. The gas was not turned on until about 4 o'clock in the afternoon, instead of 11 A. M. as had been promised. In the meantime his wife and children went to a neighboring house where they were comfortable, but the husband remained in and about the unheated house, except for the times he went to make telephone calls, until the heat was turned on. Following the installation of the meter and the turning on of the gas his family arranged the furniture, and sometime that night he took a chill. He did not remain in bed the next day but worked at his usual occupation and did not call a doctor for several days.

The lower court held the gas company liable, but the higher court reversed the decision and held that the company was not liable. The higher court said:

**"Even if it could be said there was unreasonable delay in installing this meter, such delay was not the proximate cause of plaintiff's injuries, and to constitute actionable negligence the injury must have been the natural and probable consequence of the alleged negligent act. The consequence of the negligent act must be within the range of probability as viewed by the ordinary man, and consequences which are merely possible cannot be regarded as either probable or natural. One is bound to anticipate only the reasonable and natural consequences of his conduct. Defendant could not reasonably have anticipated that plaintiff, a man of mature years would remain exposed, idle, and inactive, in this unheated house in zero weather for some seven hours."**

In other words, in this case the higher court held that the proximate cause of the husband's sickness was not delay in installing the meter, but failure of the husband to exercise reasonable care to protect himself against exposure. Under these circumstances the husband was contributory negligent which barred recovery of damages.


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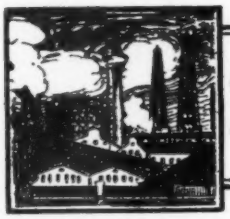

# News of the Gas Industry

## *American Gas Association Nominating Committee Reports for 1942-1943*

Arthur F. Bridge

Ernest R. Acker

J. E. Llewellyn

Announcement has been made to the membership of the American Gas Association the following report of the General Nominating Committee which will be presented to the Annual Meeting in the Fall:

*For President*—Arthur F. Bridge, Vice-President and General Manager, Southern Counties Gas Company, Los Angeles, Calif.

*For Vice-President*—Ernest R. Acker, President, Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.

*For Treasurer*—J. E. Llewellyn, Insurance Manager, The Brooklyn Union Gas Company, Brooklyn, N. Y.

*For Directors—two year terms:* John W. Batten, Vice-President and General Manager, Michigan Consolidated Gas Co., Detroit, Mich.

James A. Brown, Engineer in Charge of Gas Operations, Commonwealth & Southern Corp., New York, N. Y.

D. W. Harris, Vice-President and General Manager, Arkansas Louisiana Gas Co., Shreveport, La.

H. N. Mallon, President, Dresser Manufacturing Co., Bradford, Pa.

Hudson W. Reed, Executive Vice-President, The Philadelphia Gas Works Co., Philadelphia, Pa.

W. F. Rockwell, President, Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

Herman Russell, President, Rochester Gas & Electric Corp., Rochester, N. Y.

Marcy L. Sperry, President, Washington Gas Light Co., Washington, D. C.

T. J. Strickler, Vice-President and General Manager, Kansas City Gas Co., Kansas City, Mo.

P. S. Young, Chairman, Executive Committee, Public Service Electric & Gas Co., Newark, N. J.

R. G. Barnett, Vice-President and General Manager, Portland Gas & Coke Co., Portland, Ore.

Respectfully submitted,

*General Nominating Committee*
PAUL R. TAYLOR, *Chairman*
B. C. ADAMS
R. E. FISHER
CHESTER L. MAY
JAMES L. STONE
ALAN P. TAPPAN

The following have been nominated by Section Nominating Committees to serve as Section officers for the next Association year:

*Accounting Section:* For Chairman—L. A. Mayo, Connecticut Light & Power Company, Hartford, Connecticut. For Vice-Chairman—O. H. Ritenour, Washington Gas Light Company, Washington, D. C.

*Industrial & Commercial Gas Section:* For Chairman—B. H. Gardner, Columbia Gas & Electric Corporation, Columbus, Ohio. For Vice-Chairman—Charles G. Young, Springfield Gas Light Co., Springfield, Mass.

*Manufacturers' Section:* For Chairman—John A. Robertshaw, Robertshaw Thermostat Company, Youngwood, Pa.

*Natural Gas Section:* For Chairman—Burt R. Bay, Northern Natural Gas Company, Omaha, Nebraska. For Vice-Chairman—R. E. Wertz, Amarillo Gas Company, Amarillo, Texas.

*Publicity & Advertising:* For Chairman—Charles A. Tattersall, Niagara-Hudson Power Corporation, New York.

*Residential Section: For Chairman*—B. A. Seiple, Jersey Central Power & Light Company, Asbury Park, N. J. For Vice-Chairman—C. V. Sorenson, Midland Utilities Company, Hammond, Indiana.

*Technical Section:* For Chairman—John H. Wolfe, Consolidated Gas Electric Light & Power Co., Baltimore, Maryland. For Vice-Chairman—Charles F. Turner, East Ohio Gas Company, Cleveland, Ohio.

### New War Standards for Gas Water Heaters Available

Anticipating restriction of future production of gas water heaters to those designed to conserve strategic materials, American War Standard Approval Requirements for Gas Water Heaters, Z21.10 WS-1942 have been adopted by the American Standards Association. Sponsored by the American Gas Association, they were prepared and approved under the special procedure established for prompt development of war emergency standards. They will be in effect for duration of the emergency.

Revisions incorporated in these war standards cover mainly construction features. They are streamlined as far as possible consistent with safety and reasonable durability. No changes are made in any performance provisions with exception of one minor detail applying to storage vessels of assembled units. All safety and efficiency features are retained. In view of their modified construction, as compared with peacetime models, "utility" water heaters complying with provisions of the new standards must display the following inscription in addition to the Laboratories Approval Seal: "Approved Under War Emergency Requirements."

In addition to these war standards, three sets of new and revised gas equipment requirements were adopted as American Standard on June 5, 1942. These include new requirements for installation of gas-burning equipment in power boilers and revised editions of approval and listing standards respectively for gas refrigerators and gas valves. In view of the greatly increased use of gas for wartime industrial processes, adoption of a nationally acceptable installation guide for gas-burning equipment in power boilers is particularly significant. Special mention may also be made of the enlarged scope of gas valve requirements to provide adequate construction and performance tests for manual main gas control, pilot adjustment and pilot shut-off valves as well as gas burner valves formerly covered.

Additional information and copies of these requirements may be obtained from the American Gas Association Testing Laboratories in Cleveland, Ohio, and Los Angeles, California.

## Lead Alloys to Replace Tin for Engine Bearings

American ingenuity is finding a way to meet the tin shortage as it threatens one of the most important applications of this highly strategic metal.

Engineers believe they have now found ways to produce alloys of lead to take the place of tin alloys in bearings.

One of the most gruelling trials of new lead alloys for bearings is being conducted at The Cooper-Bessemer Corporation, Ralph Boyer, chief engineer, disclosed recently. The corporation is one of the country's leading producers of diesel engines, gas engines and air compressors vital in the war effort.

"Alloys with lead as the base metal have been put into bearings of the corporation's diesel engines and air compressors, and from all indications they are doing very well," Mr. Boyer said.

"About a year of testing will be required, however, to prove conclusively that lead is an adequate substitue. We have run our tests for the last several weeks.

"We have been forced to turn to lead as a base metal in the place of tin, and now there is every indication that lead will produce better bearings than we have ever had before."

The importance of tin as a strategic metal is brought out by the fact that bearings in every automobile being driven in the United States contains on an average about 7½ pounds of this metal. The bearings contain between 88 and 90 per cent tin.

"Now that the source of tin in the Far East has been cut off, the United States will have an increasingly difficult time finding substitute sources of this metal. Tin now is being carefully allotted by the War Production Board.

"This has caused industry to turn very rapidly to bearings with lead as the base metal. The composition of the lead base alloys is being kept a carefully guarded secret. It varies somewhat with different industries. They must duplicate, as nearly as possible, the desirable qualities of tin as a base metal.

"The most critical test that could be put to a new bearing alloy is its use in an internal combustion engine such as a heavy duty diesel. It must stand up under high temperatures and pressures."

Commenting on the government's recent conservation order requiring dealers who sell material in tube containers to receive an empty one instead, Boyer observed "The unfortunate thing about this order as it applies to the tin user is that metallic tube containers are made largely of aluminum."

## Annual Meeting A. G. A.

**The Annual Meeting of the American Gas Association will be held on Monday and Tuesday, October 5 and 6, at La-Salle Hotel in Chicago.**

**Monday will be given over to meetings of the Sections and Committees. Tuesday will be devoted to General Sessions with final adjournment in the afternoon.**

**The programs for these meetings, in addition to business prescribed by law and by the Association's Constitution, will consist of discussions of war and postwar problems only. In order that the programs may be strictly up to date, it is probable they will not be completed until shortly after the meeting.**

## R. J. Canniff Appointed Adv'g. Manager of Servel

The advertising department of Servel, Inc., manufacturers of the Servel gas refrigerator, has been transferred from New York City to the factory at Evansville, Ind., it was announced by George S. Jones, Jr., vice-president and general sales manager of the company. R. J. Canniff, sales promotion manager of Servel since 1939, has been appointed advertising manager in addition to his present duties which he still retains. William Reynolds, of New York, former advertising manager, has resigned.

R. J. Canniff

Mr. Canniff has been associated with the gas refrigerator manufacturing company as its sales promotion manager since August of 1939. Prior to his connection with Servel, Mr. Canniff was associated, in various executive capacities, with the Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.; the Standard Gas Equipment Corp., Chicago; Pittsburgh Water Heater Co., Pittsburgh, Pa.; and the Ruud Manufacturing Company, Pittsburgh, Pa.

## Gas Utilities To Aid War Production Drive Through Industrial Nutrition Plan

A nationwide industrial nutrition program for war workers to be made available to managements of war plants through gas utility companies is now being developed and will soon be launched by Servel, Inc., of Evansville, Ind.

This industrial nutrition project is an extension of Servel's Home Volunteer program which has been conducted with marked success by many gas companies throughout the country.

This "Nutrition In Industry Plan" is designed to help step-up war production by building the health and morale of industrial workers through improving their eating habits. It will be carried on in conformity with existing Government nutrition plans and will utilize the best experience of the nation's leading home economists, nutrition authorities and research leaders.

The industrial nutrition program, a four-point plan, is based on the pioneering experience in this field gained among the 5000 war workers in the Servel, Inc., plant at Evansville, Ind., and on a special industrial nutrition activity carried on by the Bridgeport Gas Light Company, of Bridgeport, Conn., under the direction of Ronald A. Malony, Sales Manager.

The scientific phases of the program are being worked out in cooperation with the National Research Council which is making timely studies of war-time nutrition needs. These studies have provided indisputable proof that proper nutrition reduces fatigue and accidents; cuts down loss of time due to accidents; increases the workers' efficiency even under production schedules requiring greater speed and longer working hours. It also was found that proper nutrition improves workers' morale and health standards.

The industrial nutrition plan is being presented in a portfolio entitled "Nutrition In Industry" now being completed. It contains promotional and educational material, as well as factual and nutrition data for use by gas utility companies in connection with the industrial nutrition project.

Four principal steps are suggested in the portfolio. They call for the gas companies interesting and enlisting the cooperation of: (1) plants engaged in war production; (2) war workers in these plants; (3) neighborhood restaurants catering to war workers; (4) wives of war workers.

THE STACEY MANUFACTURING CO.
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• Gas Holders • Gas Plant Equipment • Steel Plate Construction •
GAS HOLDER INSPECTION SERVICE
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STACEY SINCE 1851
Years

## Meters Slated for Special Study by Gas Section of Wisconsin Utilities Assn.

Research topics were selected for the different committees of the Technical Division of the Gas Section of Wisconsin Utilities Association at the first conference recently held of Advisors and Committee chairmen under a new setup instituted by E. C. Hemes, Division Chairman. In conjunction with this organization conference, chairman Hemes also conducted a committee meeting which he hopes will be taken as a model by other committees.

R. A. DeMint, chairman of the Meter and Regulator committee, reports that the committee determined upon the following subjects for study: Solder recovery, with E. C. Hemes as leader; Theory and Practice of proper meter repair and adjustment with R. Schmidt as leader; large meter changes on mileage basis, with J. H. Mikula as leader; standardization of meter design, with G. A. Anderson as leader.

DeMint states that other suggested subjects will be studied if time permits. In reporting on the meeting, which served as the model, chairman DeMint says: "The reaction of the advisors and committee members to this type of meeting was excellent. A lot of good can come from such work, but only if there is complete willingness on the part of advisors and members to pitch in."

At this conference manufacturers presented their views, government priority specialist answered questions and G. A. Anderson reviewed papers and discussions on meters as presented at the Distribution conference of the A.G.A. in New Orleans.

Anderson in summary said the following methods may be used to economize in meter repair: lengthening shop repair period, close study of procedure, maintenance of good repair and test records, use of substitute materials, reclaiming, staggering repairs, good writing of changes, testing and repairing large meters in the field, use of women in repair shop, study of diaphragms and gas cleaning.

He stated there were no new developments on standardization of iron case and tin case types of meters, but emphasized that standardization is up to utility companies which must agree on fewer special designs.

Deane True, chairman of the Distribution committee, reported that the following subjects were selected by his committee for study. Benefits of wrapping steel pipe, leak location, service connections at mains, main conditioning, results of using furfural on gummy deposits, emergency repair methods, reconditioning steel pipe. Topics will be assigned to committee members and they will be expected to report at a conference in the Fall.

Paul A. Hoffman, chairman of the Customer Service Committee, advises that his committee will study and report on the following topics: Reducing Customer premises costs, one-trip calls, eliminate call backs, charges for service calls.

Association headquarters are at 135 W. Wells Street, Milwaukee.

FLOAT PROMOTES WAR BONDS

A rousing welcome, touched off by a 2-hour parade, awaited American and British war heroes on tour of the country when they arrived in Portland, Ore. Showers of rose petals from office windows and sidewalks upheld the "city of roses" tradition. This float by Portland Gas & Coke Company was a reminder that American war bonds are not to the liking of the Axis boys.

## Federal Power Commission Hearing on Pipe Line

The Federal Power Commission announced July 27th its order setting a public hearing in the Commission's hearing room in Washington, August 3, 1942, on an application by the United Gas Pipe Line Company, Shreveport, Louisiana, for authority to construct and operate approximately 38 miles of 12¾ inch O.D. natural gas pipe line in the nature of a loop of its facilities from the Lake Long Field in Lafourche Parish to a point near St. Rose, Louisiana, where the line would connect with the company's Baton Rouge-New Orleans line.

According to the application, filed June 19, 1942, United has received notice to increase its maximum daily delivery to New Orleans Public Service, Inc., from 86,000 MCF to 135,000 MCF, and to Louisiana Power & Light Company from 25,000 MCF to 48,000 MCF, not later than December 15, 1942. It is stated that these increases in demands are made necessary by the National War Program, as well as the general development in the New Orleans area.

The company states that it has applied to the War Production Board for the necessary authority and priority rating to obtain pipe and all necessary appurtenant equipment to construct the pipe line. In copies of the WPB applications filed as exhibits with the application for a certificate of convenience and necessity, the company estimates the cost of the Lake Long Loop at $1,090,000, exclusive of site.

## Gas Industry Declared Essential To the War Effort

In Release No. 279, July 14, 1942, National Headquarters of the Selective Service System announced distribution to its agencies of a list of 34 broad essential activities compiled by the War Manpower Commission. The list, which includes under broad activity classifications "the products, facilities, and services considered necessary to war production and essential to the support of the war effort," was prepared to guide local boards when considering individual registrants for occupational classification but in no way alters the statutory ban on group deferments.

In the list of essential activities released those classifications in which the gas industry is included follows:

*Production of petroleum, natural-gas and petroleum and coal products:* Drilling, rig building, and maintenance service operations, and petroleum refining. Includes also production of tar and pitch; coal gas, coke.

*Heating, power and illuminating services:* Electric light and power and gas utilities; steam-heating companies.

## Foster of Brooklyn Union Elected to Office in Controllers Institute

G. E. Foster, controller of the Brooklyn Union Gas Company, Brooklyn, N. Y., has been elected president of the New York City Control of the Controllers Institute of America.

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The Reliable Shut-Off for Street Mains

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Now has the "Z" handle for easy manipulation. When locked in place it holds. Stopper cannot slip. Gas cannot pass. Adjusted in 30 seconds.

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### American Petroleum Institute

The American Petroleum Institute's Twenty-third Annual Meeting will be held at Chicago November 9 to 13, at the Palmer House, President William R. Boyd, Jr., reports.

"This will be strictly a War Convention," Mr. Boyd said. "The Institute's annual meetings always have been working meetings, entirely different from the usual concept of an American businessman's convention, and now the far-reaching problems of the war make it more important than ever to assemble the oil industry's workers periodically for an analysis of common difficulties."

Plans for the meeting have not yet been completed, but it is expected that a preliminary program will be distributed some time early in the fall.

### B. E. Clark Joins Air Force

Bernal E. Clark, advertising and sales promotion manager of Florida Power & Light Company, has been commissioned first lieutenant in the Army Air Force and is temporarily stationed at Miami Beach, Florida. During the first World War, he served two years in the army, going to France with the 35th Division, where he was a regimental observer on the front lines in two major offensives. After the war, he returned to college and graduated in 1921 from the University of California. He has been in newspaper work, as reporter and editor, and before joining the power company in 1936 as advertising manager, he was an executive in the Miami advertising firm of Loomis, Bevis & Hall.

### Griffin of Servel Reports for Duty in the Navy

P. J. Griffin, for several years district sales manager of Servel, Inc., in the eastern Pennsylvania territory, has reported for active duty in the U. S. Navy as a Lieutenant Commander.

Mr. Griffin, whose headquarters were in Philadelphia, resided at the Town House.

Associated with Servel, Inc., manufacturers of gas refrigerators and air conditioning equipment, for the past 16 years, Mr. Griffin came to Philadelphia from Washington, D. C., where he also served as a district sales manager for the company.

### Menig and Rice Resign in P.C.G.A. Activities

C. O. Menig and A. F. Rice, Chairman and Vice-Chairman respectively of the Manufacturers Section, Pacific Coast Gas Association, have been obliged to resign their offices because of a change in the nature of their work.

The Executive Committee of the Manufacturers Section has appointed E. L. Payne, Payne Furnace and Supply Company, to fill out Mr. Menig's term, and R. G. Logue, Ward Heater Company, to fill out Mr. Rice's. E. S. Hoyt, Jr. Hoyt Heater Company, and J. J. Delaney, Reliance Regulator Company, were appointed as alternates to these new officers on the Board of Directors of the Association of Gas Appliance and Equipment Manufacturers.

### Crombie Joins C. A. Olsen Co.

The C. A. Olsen Manufacturing Company of Elyria, Ohio, manufacturers of Luxaire Warm Air Heating and Air Conditioning Equipment, announce the addition to their personnel of James Crombie.

Jim, as he is known among the heating trade, has long been associated in the heating and air conditioning field, working out of Cincinnati, Ohio.

### Job-Instruction Training by TWI

More than 150 Empire State war factories from Buffalo to New York City faced with a serious shortage of skilled workers have been able to shorten the breaking in period for new employes by 40 to 75 per cent through the aid of the Training-Within-Industry division of the War Manpower Commission.

Created to help war factories develop effective in-plant training methods and insure a continuous flow of supervisors, foremen, "lead men" and skilled workers to speed production, TWI has in the past nine months alone trained 3300 key men and women in industries ranging from aviation to shirt making in this state.

TWI is not an employment agency, nor does it set up vocational schools for teaching unskilled workers a trade. It does however provide war industries with many direct aids in the task of on-the-job training. One of these aids is the highly efficient 10 hour Job Instructor Training course which in many cases has reduced the breaking-in period for new workers by 50 per cent.

Biggest portion of TWI activities deals with the problem of Job-Instructor Training; instructing foremen and "lead" men how to teach new workers efficiently. JIT trainers are enlisted from the personnel staffs of large companies with long records of experience in on-the-job training. In five 2 hour sessions conducted on the plants' premises foremen and "lead" men in groups of 10 to 12, are taught the four fundamental steps which American industrial experience has shown are basic for breaking in a worker on any new job.

New York offices of TWI are located at 11 W. 42nd Street, and field men are attached to the War Production Board branches in Buffalo, Syracuse, and Albany.

### JOHN C. HAYS

John Coffee Hays, executive vice-president of the Stone & Webster Engineering Corporation, 90 Broad Street, New York, builders of power plants, oil refineries and other structures in many countries, died July 21st at his home, 875 Park Avenue, after a brief illness. He was sixty years old.

## Canadian News

Construction of the million dollar gas purification plant at Sarnia, Ont., for the Union Gas Company of Canada, was recently reported by U. J. Barr, local manager at the firm's head office in Chatham, to be nearing completion. The new plant which will process "still gas" which will be obtained from the refinery of the Imperial Oil nearby, will have a capacity of two million cubic feet per day. The result will be a gas of high heating value which will be readily inter-changeable with the natural gas which the company now receives from its fields in Dawn, Tilbury and other townships. The regular flow of gas into the company's transmission lines is expected to commence early in October. The gas holder being constructed by the Horton Steel Co. of Fort Erie, Ont., will have a capacity of 400,000 cubic feet.

Norman Weaver, is to be superintendent of the plant.

Russell M. Perkins, sales manager of the Union Gas Company, Ltd., in Sarnia, Ont., has been transferred by the company to similar duties at Windsor. He succeeds Archie Walker, of Windsor, formerly of St. Thomas, who died several weeks ago.

J. E. Maconachie, assistant to the vice-president of the Coal Carbonizing Co. of St. Louis, Mo., and New York, has come to Hamilton, Ont., and set up an office at 66 King street east, from which he will direct the construction of the two million dollar gas manufacturing plant being erected in that city by the Dominion Government. The United Gas and Fuel Co., Ltd., will be in charge of operation. The huge plant is expected to be in production by December at which time sufficient gas will be available to meet the present demands for large war industries.

The city council of London, Ont., is giving serious consideration to the proposed solution to the natural gas shortage as submitted recently by W. A. Gaunt, Burlington, Ont., who claims to have devised a means of manufacturing natural gas from Canadian coal. The "Gaunt process" consists in passing the coal by simple mechanical means through a heat zone of about 1100 degrees Fahrenheit, about half the temperatures used in ordinary coke ovens. The "Gaunt process" claims to do this through a revolving drum, heated externally by burning another type of very thin gas made from part of the coke produced.

The coal passing through this rotary retort gives off "smoke" which is continually drawn off and cooled so that the tar and oils condense completely and are recovered and can be refined right at the plant into gasoline, fuel oil, diesel oil, etc., claims its inventor. The result is a pure clean gas of 800 heat units which can be used directly in the local natural gas mains, either mixed or used alone.

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# Industrial Gas Engineering

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**Raymond F. Mann**

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## Flash-Back Instrument

*(Continued from page 17)*

variables such as the original setting of the air shutter and pressure fluctuations. Suppose a city with a high space-heating load added carburetted water gas in the winter when the peak load was high but, in the summer, was able to carry the load on straight coal gas. Now suppose a plumber sold and adjusted three water heaters. No. A heater was installed in the summer and to have a good flame the air shutter was set at point A, ¾ open. Heater B was installed in the fall on an average mixed gas and the air shutter set at B, ½ open. Heater C was sold in the winter and adjusted with an air shutter ¼ open. The English and Rochester tests show how the index number of a mixed manufactured gas drops as carburetted water gas is added. Now further decreases in the index number of the mixed gas, though they be for a minute (such as a slug of water gas or air), will shift these three points toward A1, B1, C1, and if they meet the approaching limit line the burner will flash-back. On the other hand, if the hydrocarbon content of the gas is allowed to increase considerably, the points will be shifted to the right and A2 indicates the flames will blow-off the ports; B2 indicates that CO will result from incomplete combustion; and C2 indicates that yellow tips will be produced.

All this is bad enough but then there are pressure changes brought about by manual manipulation of the gas valves, by thermostatic control which is now quite common for both domestic and industrial applications, by mains pressure fluctuations and by inadequate supply lines. So as not to complicate the chart only heater B will be considered. Depending on the burner design, the primary air injection curve might follow the line B3 to B4 in which case low pressures would cause flash-backs and high pressures incomplete combustion or the air injection might follow the curve B5 to B6, in which case low pressure would produce yellow tips and high pressures lifting flames. Another design might give a more normal curve between these two. If heaters A and C had been considered the possibility of trouble developing would have been much greater.

Fortunately, pressure troubles are easily corrected because pressures can be readily measured with a very simple U gauge and pressure regulators can be installed if necessary. There is no such standard tool for measuring gas quality in this country and the result is that bunsen burners are usually adjusted to look normal on the gas supplied at the time, without thought being given to the fact that the gas might not be normal at that moment. This would suggest the need for an inexpensive gas testing tool for field use as well as a more elaborate instrument for laboratory use.

If arbitrary limits for gas quality, of say from 24 to 31 F.B.N., are maintained by the Gas Works then the appliance testing laboratory for that gas company should use a normal gas of 27 F.B.N. on which to adjust the appliances and then test them out on two extreme gases, one reading say 20 F.B.N. and the other 36 F.B.N. If the appliance will not pass on these gases there is not enough margin of safety and it should be rejected because not only would it be very expensive to maintain in service, but more important still, it would be a bad advertisement for gas and, in time, the consumers would probably get "fed up" on gas and switch over to electric. To obtain these extreme gases, doping the base gas may be necessary as suggested by Mr. Minchin of Watson House Laboratories, London. For instance, air will bring the flash-back number down and bottled gas (Pyrofax) will raise it.

Most of what has been said applies to manufactured gases of less than 500 B.T.U.'s but there is a possibility that a standard test burner of suitable design would be welcomed by the natural gas companies of Western Ontario to help them in maintaining consistent flame characteristics now that they must augment their supply with manufactured gas, refinery gas, propane, etc., due to a heavy war load.

### Conclusions

Observations made on a Swedish flash-back instrument have shown it to be a tool of victory for the home front in maintaining trouble-free gas for our vital war industries, and in freeing servicemen and gasoline and rubber for other more important tasks. After the war is over, competition for cooking and water heating will probably be keener than ever due to the surplus of electric power, and it will only be by the continued use of victory tools and scientific methods that we can hold our own. The satisfactory combustion of gas with bunsen burners requires that the gas be of fairly uniform quality, more so with modern appliances than formerly, because of the variety of accessories, that are now considered as standard equipment.

If we had a standard instrument for making tests of gas quality it would allow of an exchange of information, and research work carried on in one gas works could be applied in another works. Nine different testing burners have been described in this paper and, no doubt, there are gas companies on this continent using other "pet" burners, perhaps home-made, for the simple reason that there is no standard available.

The writer is only one of many who have realized the need for a standard instrument and surely after all the work that individuals have already done in designing burners, it is time that the Gas Industry had a standardized test instrument like the petroleum industry.

The undertaking is so big that it should be given either to the American Gas Association Laboratories or to the recently founded Institute of Gas Technology to complete. To support the plea for a standard instrument, I am going to quote from Mr. Keillor's paper in the 1938 C.G.A. Proceedings: "If we had handy portable instruments which would make it possible to assess quickly the value of manufactured gas in terms of percentage efficiency when used in appliances instead of cubic feet delivered at the meter, this would probably be a more exacting method of evaluation and would soon supersede the calorific value test just as the calorific value test supplanted the candle power test twenty-two years ago. But we haven't got such instruments yet. The new type of Aeration test burner and research are assisting in this work."

A similar thought is expressed in the following quotation from the paper by Shnidman and Yeaw: "In conclusion, it is suggested that there is a need for some standardized test burner so that correlated results may be obtained from a number of Work's plants and thus become of value to the industry as a whole in the control of gas quality."

The above recommendations were made in peace time, the war has intensified the need because of the enormous load increases necessitating substitute and auxiliary gases little dreamed of four years ago; any standardized test burner developed now would become our life saver in the competition of the new era following the war. Give us the tools and we'll do the job expected of us.

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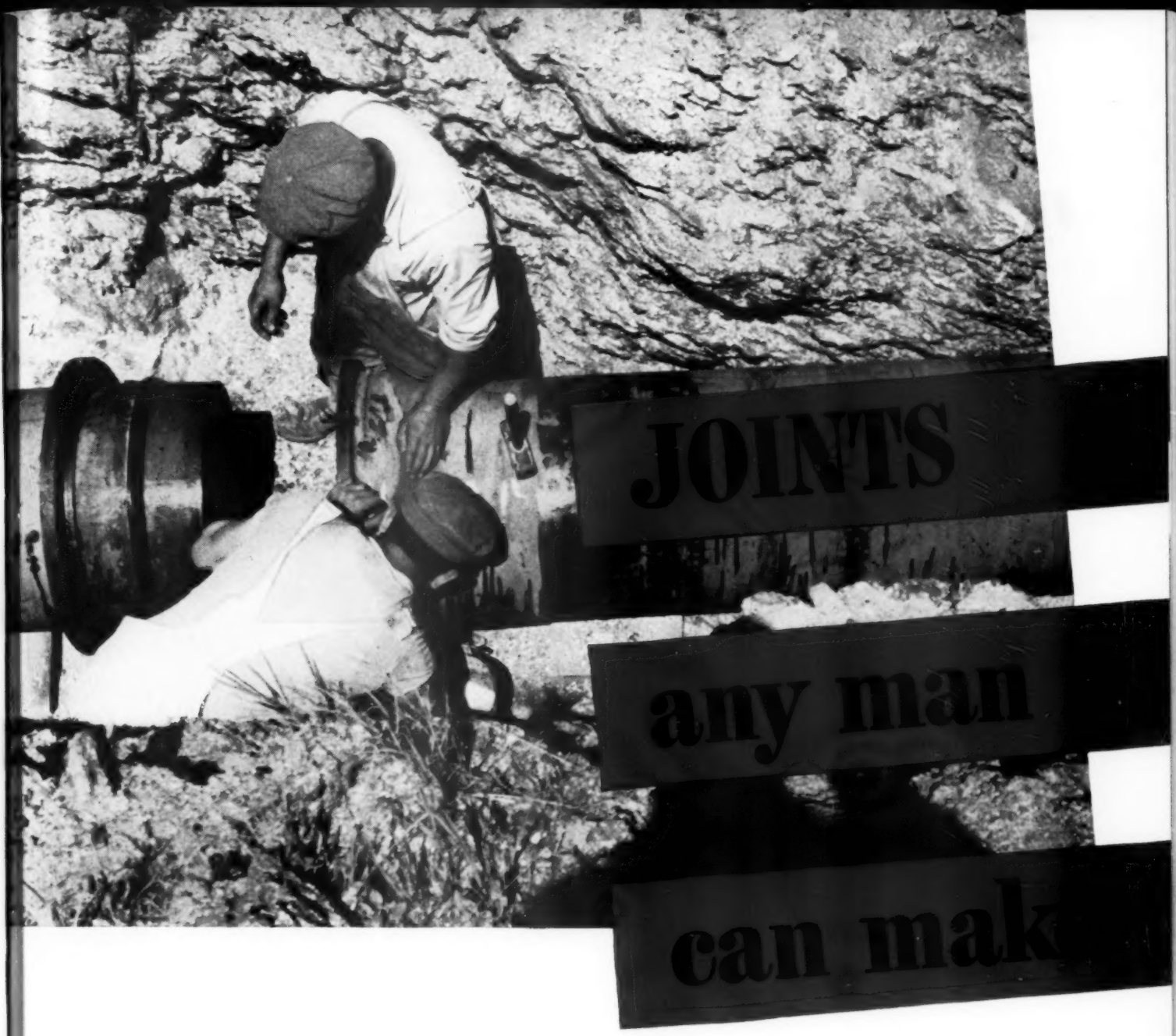
*Presented at the 35th Annual Convention, Canadian Gas Association, Montreal, Quebec, June 4th and 5th, 1942.*

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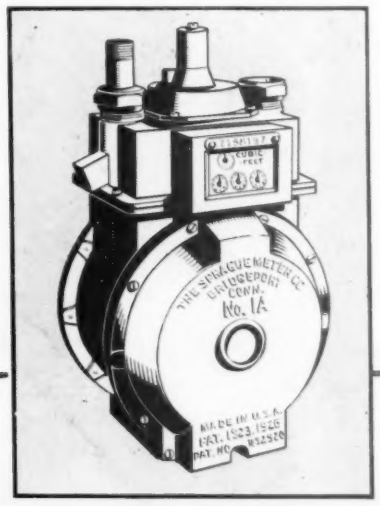
It is not easy for peace-time industries to convert to War-time necessities. It is not easy for men to change from civilian occupations to the duties of a soldier, yet if the transition was not made wholeheartedly and unquestioning the predicament in which we would find ourselves would be only too obvious. We, as equipment manufacturers for the Gas Industry, consider ourselves a part of that great body known as the "Second Front"— yet, that is not enough—we must also become part of the First Line of Defense by making our equipment do double duty. This has been accomplished not without physical and mental exertion on our part but fortunately the results have warranted the effort. Already machines that produced Sprague Gas Meters & Regulators for the four corners of the earth are now being utilized to produce War-essentials to help bring about the peace demanded by self-respecting peoples of the world.




For the Duration, we shall consider ourselves fighting on both fronts. It will not be an easy position to maintain without the full cooperation of our customers. Materials are precious and scarce, they cannot be wasted—they cannot be replaced unless WPB feels your needs warrant it. Your part on both fronts is conserving where you can and making application for special ratings where the need is imperative.

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